IN a recent talk with the writer of this column, the head of one of the leading custom molding businesses in this country thoughfully stated:

"I am more concerned over the future of the molding business than I care to admit. I believe it is facing the most crucial period in its history. Not only will it go through startling changes, but its production policy may be eventually eliminated as not being fundamentally sound. No one with any foresight in the whole industry will be the looser, but it is up to each one, **now**, to develop his own molding process, both mechanically and manually so that he will not only meet, but anticipate, the future".

There is no man in the business whose opinion counts more. He is successful in every one of his many interests, and his own plant is making every effort to do its work in anticipation of what **may** happen years from now, and we believe it will maintain its present strong position. We respect this man's opinion —more than once it has been worth money to us and to others —and broadly speaking we re-echo his statement.

The only way to face the future is to make your own research work, founded on whatever natural advantage you now have,—labor, locality, workmanship, or anything else. Increase its consumer appeal, no matter how, and make that your standard for your other developments. Probably we shall have many letters on this subject, and to those who say, "we have not enough money to appropriate any for research," we will be glad to correspond. To the others—and there will be many —who on reading this think they have not the time, let the philosophy of that fine book, **The Art of Thinking**, tell them "very busy people always find time for everything".

The only combination that will succeed in running a third or fourth class business is first class brains and imagination.

The Publishers.


# PLASTICS & MOLDED PRODUCTS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 5 AUGUST, 1929 No. 8


## Contents






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PLASTICS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 5 AUGUST, 1929 No. 8

# Unusual Applications of Plastic Materials

## From a collection of more than fifteen hundred patents, the author selects those that exhibit the versatility of our modern synthetic plastics

*By Charles W. Rivise*

*The writer, one of the advisory editors of PLASTICS, was formerly an examiner in the U. S. Patent Office, and has assembled a remarkably complete collection of patents dealing both with the manufacture as well as the application of the modern synthetic plastics, especially the resinoids.*

*The present articles is the beginning of a series dealing with this subject. It deals only with U. S. Patents.*

NO sooner is the discovery or invention of a new substance announced than the Patent Offices of the world are deluged with a flood of applications for Letters Patent covering alleged novel uses and applications of the new material. Many of the alleged new uses are merely obvious applications of known properties and principles. Many are the work of "desk inventors", i. e., men who read all the scientific literature as well as patents as soon as they are made available to the public and immediately file patent applications for every conceivable use or modification that suggests itself in the hope that by some chance one or more of them may form the basis of a valuable patent. A few are carefully worked out and tested by painstaking investigators in well equipped laboratories.

### Practical and Visionary Ideas

Of the large number of applications filed, comparatively few ever see the light of day as patents. Many of those that are granted are doubtlessly valid and of great value. Some of them, far from being valuable contributions to the arts, serve no useful purpose but to harass and exact ill-earned tribute from the industry. This is not to be taken as an indictment of our Patent Officials, who, as is well-known, are conscientious in their efforts to give a worthy inventor all that is coming to him in the form of patent protection and to keep from an unworthy claimant the monopoly of a patent right, which, when improperly granted, can throttle a promising industry. In justice to the Patent Office, let it be explained that most of the improperly granted patents can be traced to the fact that the Patent Office does not have at its disposal any means to test out the claims of ambitious inventors and must in many cases allow its better judgement to yield to ex parte affidavits of interested parties.

The purpose of the present paper is not to weed out the worthless patents from the vast number that have already been granted in this field. That would be a thankless task and would be usurping the functions of our Federal Courts. Rather, the purpose is to indicate to the industry what a mass of potential wealth is hidden in the patented files of the U. S. Patent Office, by bringing into the limelight a few of the more unusual applications of the artificial plastics that are disclosed in the writer's collection of more than 1500 patents. By so doing it is hoped that more of them may find industrial application.

### Construction Materials

J. M. Callow and N. P. Corliss in Patent 1,331,238 dated February 17, 1920 propose making bricks out of Bakelite. The phenolplastic is reduced to a syruplike consistency, mixed with sand, molded into brick form, dried and baked to hardness. Reenforcing elements such as galvanized wires may be incorporated into the material. The brick is said to be suitable for the bottom of tanks used in flotation or in filtration work.

A marble substitute particularly suitable for switch boards may be made according to Patent 1,309,275 dated March 14, 1922 to E. O. Benjamin by coating an inert material such as asbestos, mica or talc with a phe-

nol resinoid and mixing the comminuted material with a rubber sulphur mix. Fillers may be added and the product molded into sheets, blocks, bars or rods.

Several inventors have directed their efforts to devising methods of making artificial lumber suitable for furniture. Thus in Patent 1,625,749 dated April 19, 1927 Seabury proceeds as follows: — Non-impregnated but pervious sheets of paper or cloth or veneers of wood are applied to one or both sides of a fibrous base consisting of one or more sheets of paper, felt or cloth impregnated with a phenol condensation product in the fusible or "A" stage and the assembly consolidated between the platens of a hydraulic press so that the outer layers are impregnated from within outwardly. The platens may shape the assembly to any desired curvature or contour and may impress a design or configuration thereon. The product is said to be eminently suited as a substitute for mahogany in furniture and cabinet work.

### Desks and Tables

Another example is Patent 1,343,216 dated June 15, 1920 to J. H. McClain, in which a sheet of fabric such as paper, textile material or felt such as cotton batting embodying a binder and a desired color or figure design is dried or partially dried and applied to the surface of a piece of furniture such as a desk, table or sideboard, after which it is compacted by means of an oiled metal plate to insure a smooth polished surface. The impregnated sheets may be interposed between two plies of wood and consolidated by means of heat and pressure as disclosed in Patent 1,299,747 by the same inventor.

### Honey Combs

E. L. Sechrist in Patent 1,282,645 dated October 22, 1918 suggests making the broad frame and the comb foundation for a honeycomb of Bakelite. The Bakelite is preferably covered with beeswax to make it acceptable to the bees.

### In Aviation

In Patent 1,435,244 dated November 14, 1922 Kemp illustrates an airplane many of whose parts are made of laminations of fibrous or cellular material such as paper, fabric or wood impregnated with condensation products of phenol and formaldehyde, the layers being wound, wrapped or molded into the preferred shape and baked to form a rigid body. Among the elements mentioned as being made as above are the fuselage or vehicle body, streamlined covering, a wing panel, a wing rib, blade sections of elevating planes, channel shaped supporting planes for the ailerons, struts or wing posts and propellers.

A method and apparatus for making the fuselage or pontoon of aircraft is disclosed by Kemp in Patent 1,572,936 dated February 16, 1926. Fibrous material such as paper or duck is impregnated with a phenolic resinoid and assembled about a core composed in part of a material having a low fusing point such as an alloy of bismuth, tin and lead and in part of filler members of suitable shape such as pellets of a material having a higher fusing point. Heat is applied to fuse the fusible part of the core and pressure is applied to force the fused material against the body being molded. The mold may be of the open type. It is stated that the same form of apparatus and method may be used to mold boats.

### Containers

The artificial plastics on account of their physical and chemical inertness readily lend themselves to the making of all sorts of receptacles and containers. However, the application of some of the containers made from this material are rather unusual and unobvious as will appear from the following examples.

The first suggestion along this line was made by L. H. Baekeland in Patent 957,137 dated May 3, 1910. The container or the sheet material from which the container is to be made is "pickled" by acid treatment; a coating of partial phenolic condensation product containing fillers such as pulverized silica, powdered glass, slate dust, asbestos stone is applied and cured by heat and pressure. The container is said to be suitable for food products. Other patents mentioning such an application are Patent 1,094,830 to J. W. Aylsworth dated April 28, 1914 and Patent 1,158,962, to W. A. Beatty dated Nov. 2, 1915. The latter patent also suggests coating metal or paper pans or dishes to make them suitable to contain food.

### Battery Wells

A battery well is made by F. L. Dyer in Patent 994,067 dated May 30, 1911 according to the following method:—The walls of the well are formed of wood or other fibrous material impregnated with a final phenol condensation product with or without an inert filler. The product may be formed in situ by soaking the walls in the necessary ingredients, phenol or cresol and formaldehyde. A variation consists in forming the walls entirely of a resinoid with or without an inert filler.

### Dash-Pot Casings

A container suitable as a dash-pot casing is made as follows according to Patent 1,332,045 to W. H. Kempton dated Feb. 24, 1920:—Fibrous sheet material such as paper or duck or loosely matted fibrous material such as cotton batting is impregnated with Bakelite, stacked to suitable thickness, cured with heat and pressure and slabs punched therefrom. A variation is to cut the disks before the stacking and pressing step. The preformed disk is disposed between two mandrels of different lengths and of a less diameter than the disk and other impregnated material is wound about the disk and the two mandrels. Graphite may be either incorporated in the binder or sprinkled over the material be-

*(Continued on page 456)*

# Casein, Resinoids and Cellulose Esters Welded into Mixed Plastics

## Hardening of casein with furfural; blending of resinoids with casein solids; and plastics comprising cellulose esters and resinoids described.

IT would be quite difficult to classify properly the peculiar molding composition about to be described. Hitherto most of the patented and unpatented compositions for this purpose have naturally fallen into distinct classes or types, such as phenolic resins, casein solids, thermoplastic rubber composition, cellulose esters or natural gums such as shellac. The Western Electric Company has however a striking contribution to the possibilties of producing what we might well term "heteroplastics" which combine, so it would seem, some of the properties of all of the known (and unknown) plastic materials.

*"Heteroplastics" may be a good name to define the novel type of products recently patented to the Western Electric Co. as this large concern has in the past been a leader in adopting new plastics and in commercializing their use, anything that issues from their research laboratories is always interesting.*

### Casein, Furfural and Rosin-Glycerol Esters

Sidney Marion Hull is the inventor of a novel type of product that he describes in his U. S. P. 1,711,025; April 30, 1929, assigned to the Western Electric Co. It is a condensation product of casein, furfural and a rosin-glycerol resin; plus various fillers among which slate dust is favored. Other resins may also be added. As there is much that is new to the plastics field in this patent, some excerpts from it will undoubtedly prove interesting. For example:

The invention consists in mixing together the required amounts of protein and aldehyde, such as casein and furfural, and then subjecting them to heat and pressure to cause a more rapid condensation. A filler may be added to the casein before mixing and the compound may be further waterproofed by incorporating another material which is water-resistant per se or in combination with the compound. This water resistant material is added preferably by dissolving it in the furfural before the admixture of the furfural and casein.

According to the preferred form of the invention casein or other proteins, such as glue or gelatine in a dry state, are ground to a fine powder and mixed with the required amount of furfural to bring about complete condensation. In forming this preliminary mixture of casein and furfural, there is a great deal of latitude, but a proportion which has given good results is 10 parts of casein to one part of furfural. By varying the amount of furfural used the properties of the final product may be changed and to a certain degree controlled. The ideal condition to obtain optimum properties is to employ proportions of casein and furfural so that after condensation no free furfural or casein will be present. In general the use of a less amount of furfural gives a softer final product.

When the casein and furfural are mixed together they present the appearance of a moistened mass. This mass may be molded into shape under pressure and while in the press, heat being applied for various lengths of time depending upon the nature of the specific product desired. In general the temperature should be between 175° F. and 225° F. and the pressure should also be consistent with the density required in the final product. The duration of heating may be from 10 minutes to an hour. The material so produced is a hard resilient plastic mass, resembling bakelite, redmanol and similar materials, and a conchoidal glassy fracture is shown when it is broken.

When casein is mixed with furfural the condensation takes place slowly so that sufficient time exists for the satisfactory commercial handling of the material. For instance, a mixture of furfural and casein may be allowed to stand at room temperatures for three or four days before any noticeable hardening results.

### Waterproofing

The product of the condensation of furfural and casein when produced under heat and pressure is in general considerably more waterproof than other protein-aldehyde compounds. However, in order to increase the resistance to moisture of this product, advantage may be taken of the solvent properties of furfural for a wide variety of materials. For instance, a rosin-glycerol ester may be dissolved in the furfural in the proportion of one to one, and this

solution used for the condensation with casein. Using a gum in this form it is spread uniformly throughout the entire mass and renders the plastic quite resistant to moisture.

Other materials such as cellulose-esters; various gums and resins, either natural or synthetic; bituminous materials; tung oil and other polymerizable oils with or without being previously heat treated; waxes, and the like may be incorporated in the same manner. Other solvents than furfural may be used for dissolving and distributing the waterproofing agents, but when other solvents are used it is preferable that they be inert, organic, volatile and miscible in all proportions with furfural. Such solvents may be acetone, benzene and its homologues, or other well-known organic solvents.

### Introducing Fillers

In forming a compound of the type described, inert fillers may be incorporated for the purpose of reducing the cost of the product and otherwise changing its properties. A satisfactory manner of introducing the fillers into the compound is to grind them with the casein or mix them in any satisfactory manner, before the admixture of the casein and furfural. As an alternative when conditions and the type of materials used might require the furfural and casein might be mixed first and the mixture kneaded with the filler so as to obtain an even distribution throughout. Inert materials which may be used satisfactorily in this connection may be slate dust, magnesia, infusorial earth, wood flour, asbestos fibre, mica dust and other similar materials.

As an example of the foregoing, a composition which would incorporate the main features of the invention as described above, may be produced in the following manner:

50 parts of finely ground casein are thoroughly mixed with 40 parts of finely ground slate dust and the whole intimately mixed with 5 parts of furfural in which has been previously dissolved an equal weight, (5 parts) of a rosin-glycerol ester. The resultant moist plastic mass is then molded under 2500 pounds pressure per square inch with simultaneous application of heat at 212° F. for about 30 minutes. The material so formed is a hard, dense substance, resembling natural slate in appearance, but lighter in weight, possessing considerable resiliency and a fair degree of mechanical strength.

The particular features of importance in the invention are that the molding time is much shorter than for other protein aldehyde compounds, and articles can be molded to form, there being practically no shrinkage or distortion. The manufacture of molded articles from, for instance, casein and formaldehyde requires sometimes as much as a month's time and then additional time is required for drying.

Articles can be molded in the manner and from the materials disclosed herein in two hours; and since the water evolved during the chemical reaction is the only water present, and this is very small, no time is needed for drying. The material formed from the condensation of casein with furfural on account of its comparatively slight hygroscopicity may be employed as an electrical insulator, or for fabricating articles which are preferably resistant to the passage of electricity. In general the material may be employed to fashion articles which are usually made of bone, horn, ivory, celluloid or the like.

### Cellulose Ester Combinations

In a second patent, the same inventor (U. S. P. 1,697,-870; Jan. 8, 1929) describes an equally interesting mixture of cellulose esters with phenol-furfural resins. It would seem that it is in just such compositions and combinations that the future of plastics will be found. Someday someone is going to standardize the various plastic materials, and they will be purchased on specification. The blending of the resilient cellulose esters with the comparatively hard and unyielding resinoids is bound to produce some very interesting and useful products. The present product is used as an impregnating insulation for motors and dynamos.

In the patent now under discussion the inventor states that

(*Continued on page 457*)

# Molded Cork Gaskets

MOLDED cork gaskets and other forms of molded products which are to have a surface that is relatively free from porosity, so as to be reasonably moisture proof and impermeable, are produced by charging particles of waste cork into a die in an hydraulic press and then compressing them under high pressure.

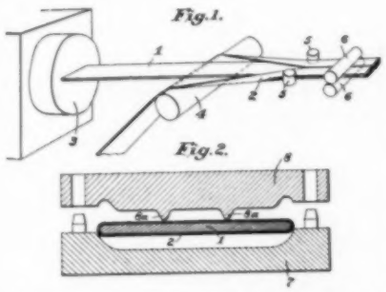
The mold is then heated, but only from one side, namely the one on which the finished product is to have its smooth impervious surface. As cork contains a resinous material, this will be volatilized by the heat and will serve to agglomerate the cork particles so that a molded product will result. As the side of the die away from the heat is at a lower temperature, the material at that point will not be nearly as dense as that on the heated side of the mold, whereby the naturally resilient nature of the cork is retained.

The heating, or as the inventor calls it, "baking" of the cork under pressure is carried out at temperatures between 150° C. to 275° C. The product is intended mainly for bottle seals and gaskets, but evidently has wider application. The process forms the subject matter of U. S. Patent 1,702,600; Feb. 19, 1929, of William F. Grupe, and is assigned to the Boucher Cork Co., of New York.

# Window Guides for Automobiles Extruded

**While at present applied to rubber compositions there appears no reason why this method should not also be applied to semi-cured resinoids and permanently plastic materials like cellulose acetate**

MORE and more parts on the modern automobile are being made by the methods of molding plastic materials. A few years ago only a few distributer heads on the ignition system were made of plastic materials, but since that time we have been accustomed to molded steering wheels, horn buttons, switch-assemblies, instrument boards and cases, cigar-lighters and the like.




Now comes Richard T. Griffiths, of Akron, Ohio and assigns to the Miller Rubber Co., of that city a patent, U. S. P. 1,708,059; April 9, 1929 for a method of molding the window-guides of closed cars. While he describes his method in conjunction with the time-honored soft rubber composition, it appears quite obvious that the process, or one like it, is equally applicable to the production of similar articles from other thermoplastic materials such as cellulose ester molding compositions or synthetic resins.

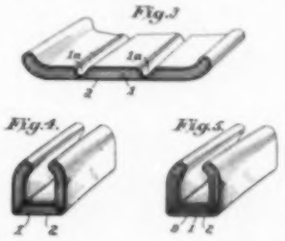
In proceeding according to this method there is provided a strip or slab of unvulcanized rubber compound 1 with an envelope or covering 2 of felt or other suitable fabric. This may conveniently, expeditiously, and economically be produced by extruding a strip or slab of rubber from an extruding machine 3, (shown conventionally in Fig. 1) having a die opening which will produce a strip or slab of rubber 1 of the desired width and thickness.

A strip or web of fabric 2 of sufficient width to enable it to be wrapped around or encompass the rubber strip is led from a suitable source, over a guide roller 4 at which point the rubber strip issuing from the extruding machine is superposed on the fabric. From the guide roller the assembled strips pass to folding rollers 5 journaled to rotate about horizontal parallel axes. The rollers 5 and 6 fold the margins of the fabric about the rubber strip or body and press it against the strip with sufficient force to cause it to adhere to the rubber.

### Shaping and Vulcanizing

The covered strip thus produced may be then cut into suitable lengths and is then ready for shaping and vulcanizing. This is accomplished by providing a mold comprising lower and upper sections 7 and 8 having the customary dowel pins and openings. The lower mold section has the main portion of its bottom formed as a plane surface, being curved upward at the side. The upper section has its molding face provided with a pair of parallel approximately wedge shaped ribs 8a which, when the mold is closed, press or force the upper fabric surface down to form two parallel channels 1a in the covered strip, the rubber being forced laterally or displaced by the pressure of the ribs 8a, whereby lines of fold are formed in the strip.

Preferably the ribs 8a are made of such height that practically all the rubber is displaced at the fold lines and the upper and lower layers of the fabric are pressed together at the bottom of the channels and united by the adherent rubber, so that flexible fabric hinges are provided. The side margins of the male and female portions of the mold sections are so curved that after the mold has been closed and subjected to vulcanizing heat the article will have the shape shown in Fig. 3, providing an intermediate base portion and two side wings flexibly connected thereto and provided with curved outer edges or margins. Such strips, in addition to being very rapidly and economically manufactured, may be shipped to the trade without loss of space as they may be piled one upon the other.




When the article is to be applied to the window the marginal portions are folded up perpendicular to the base as shown in Fig. 4, for placing in the door frame of the car or other window frame space. The side wings being held in the position shown in Fig. 4 by the door frame, their inwardly deflected edges yieldingly grip the edges

(*Continued on page 458*)

# Pyroxylin as an Imitative Material

## One of the most interesting applications of the pyroxylin plastic materials has been the production of artificial pearl and sea-shell effects

*By Joseph Rossman*

THE use of various kinds of fish scales for preparing imitation pearl and their application to pyroxylin plastics was described on p. 399-401 of the previous issue, from which the further material below is a continuation.

*The present review began on p. 69 of the February issue of PLASTICS. Being compiled from the patents themselves and from other reviews, it is accurate and authoritative, setting forth what a host of inventors have contributed to this art.*

*The author is an examiner in the U. S. Patent Office, and one of the Advisory Editors of PLASTICS, and well qualified to digest and abstract the closely related patents in this field.*

*For other earlier parts of this series see March, p. 132; April, p. 200; May, p. 251; June, p. 320, and July, p. 386.*

### Extruding Process for Imitation Mother-of-Pearl

Various attempts have been made to produce a diffused sheet effect in pyroxylin and other plastic compounds in imitation of mother-of-pearl, and various pigments have been proposed for this purpose. These efforts have been directed along two principal lines of operation. According to one line of operation the pigment employed is incorporated in the plastic mass by kneading or otherwise, either in a mixing machine or during the subsequent calendaring operation to which the plastic material is subjected, then the mass is subjected to heat and pressure to form it into a solid block which, after cooling, is sheeted into sheets.

### Coating With Pigments

According to another proposed method the plastic mass is kneaded in a mixing machine or by roller compression or otherwise without the incorporation of a pigment within the mass. The mass is formed into a block or cake by compression and heat and then is cut into thin sheets, one or both of the surfaces of the individual sheets is rubbed over with a pigment suspended in a liquid, or else the pigment is applied to the surface (one or both) of the sheet by flowing it thereover in the form of a thin film. The sheets so treated are then stacked up into a pile which is subjected to heat and pressure to form the same into a block or cake. This block or cake is again sheeted, and the sheets employed in the manufacture of various articles of commerce.

In carrying out the process of patent 1,607,623 dated Nov. 23, 1926, for securing high luster effect, a celluloid composition is first produced in the usual and ordinary way. This mass is then thoroughly kneaded into a dough with an excess of solvent, all dirt and extraneous matter being filtered off, resulting in the production of a plastic mass. Into this plastic mass is then thoroughly incorporated a fish scale pigment suspension in a solvent which is miscible with the plastic mass, such as alcohol, acetone, or the like. After adding the pigment in this manner to the mass, the mass is thoroughly kneaded in a mixing machine, or otherwise, to thoroughly incorporate the pigment in and uniformly distribute it through the mass. The excess of solvent contained in the mass is then removed in any suitable manner. This may be conveniently accomplished by kneading the mass on warm rolls or by working it back and forth in a kneading apparatus of common construction, to permit the evaporation of the solvent. The mass with the excess of solvent removed therefrom is then subjected to heat and pressure until the mass is sufficiently cooked and reduced to a more plastic or fluid condition. The mass is then extruded under increased pressure from the receptacle in which it is subjected to heat and pressure, and through a hot die which delivers the material in the form of a thin body or sheet, according to the construction of the die, the surface of which body or sheet becoming ironed, polished or calendered during the extrusion operation, causing the facets or surfaces of the pigment particles which have previously been incorporated into the mass, to be disposed in uniform direction in the extruded product. These sheets, or sheets formed from the thin body obtained as a result of the extruding operation, are then stacked into a pile and the pile is again subjected

(*Continued on page 459*)

# Ultra-Violet Light Transmission Characteristics of Some Synthetic Resins

## Ultra-Violet light tends to decompose most of the resins, causing yellowing. Methods of measuring and the results of tests are described

*By D. L. Gamble and G. F. A. Stutz*

The New Jersey Zinc Co., Palmerton, Pa.

**Ultra-violet light tends to decompose most of the resins and gums, this decomposition being accompanied by a yellowing of the material and an increase in its absorption of ultra-violet light. A comparative study has been made in which the ultra-violet absorption characteristics of a number of synthetic resins have been determined and the resins classified according to these characteristics. Transmission measurements were made on both the unexposed resin and after exposure to ultra-violet light for 48 hours. The degree of yellowing accompanying exposure to ultra-violet light was also determined. These data correlated with the results of actual exposure tests should give indications as to the ultra-violet absorption characteristics most desirable in a resin.**

THE ultra-violet portion of sunlight is known to have a decomposing action on natural and synthetic resins and on protective coatings in general. It was thought that an investigation of the ultra-violet absorption characteristics of the synthetic resins would be of interest and use to those concerned with the development and application of this group of materials.

### Classification of Resins

Synthetic resins and natural gums may, in general, be classified according to their ultra-violet light absorption characteristics in the following manner:

I—Relatively opaque resins

A—Relatively stable under ultra violet radiation,

B—Relatively unstable under ultra-violet radiation, accompanied by marked increase in opacity

II—Relatively transparent resins

A—Relatively stable under ultra-violet radiation

B—Relatively unstable under ultra-violet radiation, accompanied by markedly increased opacity.

### Method

Transmission measurements were made on both the unexposed resin and the resin after 48 hours' exposure to ultra-violet light. The degree of yellowing accompanying exposure was also determined. A few of the natural gums were included to serve as bases of comparison.

The decomposition of resinous materials resulting from the action of ultra-violet light is accompanied by a yellowing of the material and an increase in light absorption. In general, the resinous materials are both more opaque and less sensitive to the ultra-violet light than are oleoresinous or nitrocellulose films. For this reason the incorporation of a resin affords a certain degree of protection to the highly sensitive oleoresin or nitrocellulose. I-A should therefore be the most desirable type of resin for use in protective coatings as regards transmission characteristics, because of the relatively high degree of protection afforded the rest of the film and its tendency to retain its other desirable properties. I-B and II-A would be fair types, the preference of one over the other probably depending upon the relative amounts of resin and oil or resin and nitrocellulose used. II-B would be the least desirable type, affording little protection to the rest of the film and having a marked tendency to decompose upon exposure.

This classification does not indicate the general suitability of of a resin for use in lacquer or varnish. Such a classification would necessarily include such factors as the physical and chemical properties of the resin and its resistance to "weathering" in general. Indications are that certain synthetic resins have a chemical stabilizing action on nitrocellulose. It is therefore entirely possible that a resin having undesirable ultra-violet absorption characteristics might prove superior when used in lacquer because of a chemical stabilizing action. This might often be the case when synthetic resins are compared with natural gums that do not appear to stabilize nitrocellulose.

### Transmission Measurements

—These measurements were made with a quartz spectrophoto-meter as used by one of the authors in previous work on paint vehicles,[2] on thin films of the resins on transparent quartz plates. The films were prepared from solutions of the resins in suitable solvents by flowing the solution out on a plate and allowing the solvent to evap-

1 Presented before the Division of Paint and Varnish Chemistry at the 76th Meeting of the American Chemical Society, Swampscott, Mass., September 10 to 14, 1928.

2 Stutz, Ind. Eng. Chem., 18, 1235 (1926) 19, 897 (1927).

Reprinted, by permission, from Industrial and Engineering Chemistry, April 1929, Vol. 21, p. 330.

orate. A 50 per cent mixture of toluene and butyl acetate was used as the solvent whenever possible, because a large number of the samples were obtained already dissolved in these solvents and it was thought that use of the same solvent mixture whenever feasible would reduce any error due to retention of the solvent to a common basis. However, the possibility of such an error is only slight because of the relatively high transparency of the organic solvents. This procedure yielded films having an average thickness of about 0.01 mm. The thickness measurements were made with a Randall-Stickney micrometer thickness gage.

### Degree of Yellowing

Transmission measurements were made at two different thicknesses of each film. The absorption coefficient was calculated to the relationship:

where

$$I = I_0 10 - kt$$

$I$ = intensity of transmitted light

$I_0$ = intensity of incident light

$t$ = film thickness, in centimeters

$k$ = coefficient of absorption

From the average value of k, determined at the two different thicknesses, the percentage transmission at a film thickness of 0.01 mm. was calculated. These values are recorded as a measure of the transparency of of the resin.

The exposure to ultra-violet light was carried out in a cabinet held at 40° C. The films were placed 45 cm. from a 15-cm. Cooper-Hewitt mercury arc.

Degree of Yellowing—The degree of yellowing accompanying exposure to ultra-violet light was measured by determining the yellow index value before and after exposure. This yellow index is an arbitrary figure which, in general, is found to be indicative of the degree of yellowness. This value is determined from transmission measurements made in the blue, green, and red portions of the visible spectrum with a Keuffel & Esser color analyzer. It is calculated by subtracting the per cent transmission in the blue (4800 A.) from the per cent transmission in the red (6300 A.) and dividing by the per cent transmission in the green (5400 A.)

### Results

Table I gives the results obtained and classifies the materials. Figures 1 to 5 are representative transmission curves obtained for the various types of resins and show the transparency of these materials before and after 48 hours' exposure to ultra-violet light. Figure 1 gives some idea of the difference in opacity and stability exhibited by the various types of materials measured. The curves for clear nitrocellulose are included to serve as a standard of comparison.

The various types of resins were found to have distinct trends in their transmission characteristics and the classifications are based on these trends. There are, of course, some deviations from the general trend. A more complete arrangement would consist of reclassification within the different groups.

### Discussion

The synthetic esters measured (congo, manila, and rosin esters) were placed in Class I-A, being moderately opaque and having relatively low sensitivity to ultra-violet light. Ordinarily, a relatively opaque resin will be more susceptible to decomposition by ultra-violet light than a relatively transparent one, since only absorbed light can be effective. For this reason only a limited number of materials would be expected to fall into this class.

The phenol-formaldehyde, glycerol-phthalic anhydride, and coumarone-indene types were found to have similar transmission characteristics. These materials, being relatively opaque and quite sensitive to ultra-violet light, were placed in Class I-B. All exhibit about the same opacity but differ in their sensitivity to the ultra-violet, the coumarone-indene group being the most readily decomposed. Although phenol-formaldehyde condensation products exhibit a general trend, they are somewhat erratic in their transmission characteristics. This is to be expected when one considers the great number of condensation products derivable from these materials. They are only moderately affected upon exposure, but their sensitivity is such that they can hardly be considered light-fast.

### Natural Gums

In general, the natural gums and resins are both less sensitive to the ultra-violet and more transparent, especially in the shorter wave lengths, than are the synthetic materials. As a group the natural resins were classified as II-A types. It is of interest to note that when manila and congo gums are compared with the corresponding glycerol esters, the effect of esterification seems to be a decrease in transparency accompanied by a slight reduction in the sensitivity, while in the case of rosin and ester gum the reverse is true. Kauri gum was found to be the most stable of the natural resins measured.

### Other Resins

The glycerol-phthalic anhydride oil resins were also placed in Class II-A. Although these resins are very opaque in the short wave lengths, they are quite transparent in the region from 3200 to 4358 A. and can be classed as moderately transparent materials. The glycerol-phthalic anhydride oils are extremely light-fast.

The two vinyl compounds were placed in Class II-B, having high transparency and being considerably decomposed. The mixture of polymerized vinyl acetate and chloride is both more opaque and less sensitive than vinyl acetate alone.

It was found that, in general, the greater the yellowing accompanying exposure the greater was the increase in opacity to ultra-violet light. However, there are several exceptions which may be due to the yellow

index not being a true saturation and the indices not being corrected for differences in film thickness.

It must be borne in mind that ultra-violet transmission characteristics alone cannot be taken as an indication of the general suitability of a resin for use in protective coatings. The relative merits assigned to the various groups in the classification used above are based on theoretical considerations, no data being given to substantiate them. However, data presented, if correlated with results of actual exposure tests, should give indications as to the ultra-violet transmission characteristics most desirable in a resin.

**Acknowledgment**

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**Table I—Ultra-Violet Transmission by Resins**

| Expt. | Type of Resin | Ultra-Violet Exposure | Transmission at 0.01 mm. Thickness at Wave Length: 4358 Å. | 4047 Å. | 3655 Å. | 3131 Å. | 3023 Å. | 2968 Å. | 2800 Å. | 2655 Å. | 2536 Å. | 2400 Å. | Yellow Index |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Hours* | % | % | % | % | % | % | % | % | % | % | |
| | Class I–A: | | | | | | | | | | | | |
| 13 | Glycero manila ester | 0 | 61.7 | 52.4 | 43.3 | 27.2 | 23.9 | 22.0 | 15.0 | 7.6 | 0.3 | (a) | 0.105 |
| | | 48 | 57.4 | 41.8 | 35.0 | 17.9 | 16.0 | 14.6 | 7.6 | .. | .. | .. | 0.203 |
| 12 | Glycero congo ester | 0 | 68.6 | 63.8 | 58.8 | 41.3 | 38.0 | 36.3 | 25.8 | 10.3 | .. | .. | 0.092 |
| | | 48 | 63.7 | 57.5 | 47.5 | 34.0 | 25.8 | 20.6 | 10.5 | .. | .. | .. | 0.171 |
| 39 | Special ester gum | 0 | 72.7 | 72.7 | 59.7 | 39.0 | 33.5 | 30.2 | 23.7 | 15.0 | 6.0 | .. | 0.034 |
| | | 48 | 55.2 | 51.9 | 38.4 | 22.1 | 17.9 | 16.3 | 9.7 | .. | .. | .. | 0.060 |
| 21 | Ester gum | 0 | 89.5 | 80.3 | 77.2 | 49.6 | 43.3 | 40.3 | 29.0 | 4.0 | .. | .. | 0.024 |
| | | 48 | 80.3 | 75.0 | 67.5 | 38.7 | 33.0 | 28.6 | 3.6 | .. | .. | .. | 0.081 |
| | Class I–B: | | | | | | | | | | | | |
| 7 | Phenol-formaldehyde (domestic) | 0 | 39.8 | 30.9 | 20.6 | 12.0 | 8.6 | 7.3 | 3.9 | .. | .. | .. | 0.112 |
| | | 48 | 22.7 | 14.3 | 9.0 | 0.3 | .. | .. | .. | .. | .. | .. | 0.143 |
| 8 | Phenol-formaldehyde (domestic) | 0 | 46.2 | 33.7 | 29.8 | 16.1 | 12.4 | 10.3 | 5.0 | .. | .. | .. | 0.132 |
| | | 48 | 33.0 | 15.7 | 7.2 | .. | .. | .. | .. | .. | .. | .. | 0.194 |
| 15 | Phenol-formaldehyde (domestic) | 0 | 41.5 | 39.3 | 33.5 | 20.6 | 16.0 | 13.6 | .. | .. | .. | .. | 0.154 |
| | | 48 | 36.7 | 29.7 | 20.3 | 5.9 | .. | .. | .. | .. | .. | .. | 0.175 |
| 4 | Phenol-formaldehyde (domestic) | 0 | 57.2 | 49.2 | 39.0 | 22.7 | 18.2 | 15.7 | 6.3 | .. | .. | .. | 0.168 |
| | | 48 | 38.6 | 34.0 | 24.0 | 12.2 | 10.3 | 8.2 | .. | .. | .. | .. | 0.250 |
| 3 | Phenol-formaldehyde (domestic) | 0 | 59.2 | 52.3 | 37.2 | .. | .. | .. | .. | .. | .. | .. | 0.135 |
| | | 48 | 44.2 | 38.8 | 31.0 | .. | .. | .. | .. | .. | .. | .. | 0.180 |
| 11 | Phenol-formaldehyde (domestic) | 0 | 61.1 | 58.2 | 53.6 | 38.9 | 32.6 | 29.0 | 23.3 | 10.2 | .. | .. | 0.077 |
| | | 48 | 48.1 | 36.9 | 24.8 | .. | .. | .. | .. | .. | .. | .. | 0.328 |
| 6 | Phenol-formaldehyde (German) | 0 | 52.5 | 35.0 | 28.4 | 13.4 | 11.3 | 9.8 | 5.6 | .. | .. | .. | 0.103 |
| | | 48 | 33.0 | 22.0 | 16.6 | 8.5 | 6.6 | 5.6 | 0.0 | .. | .. | .. | 0.143 |
| 16 | Phenol-formaldehyde (German) | 0 | 58.0 | 48.0 | 41.1 | 24.0 | 20.3 | 18.4 | 12.0 | 5.3 | .. | .. | 0.101 |
| | | 48 | 31.1 | 23.7 | 11.3 | .. | .. | .. | .. | .. | .. | .. | 0.304 |
| 5 | Phenol-formaldehyde (German) | 0 | 77.4 | 70.4 | 59.2 | 41.9 | 35.7 | 32.5 | 19.8 | 4.4 | .. | .. | 0.153 |
| | | 48 | 65.1 | 59.2 | 49.3 | 36.2 | 30.2 | 25.8 | 8.7 | .. | .. | .. | 0.163 |
| 14 | Glycerol–phthalic anhydride | 0 | 46.9 | 36.6 | 31.6 | 17.0 | 13.3 | 12.1 | 8.8 | .. | .. | .. | 0.116 |
| | | 48 | 29.8 | 17.9 | 9.2 | 3.2 | 3.0 | .. | .. | .. | .. | .. | 0.307 |
| 2 | Glycerol–phthalic anhydride | 0 | 57.2 | 46.9 | 31.6 | 21.0 | 19.0 | 16.4 | 7.5 | 3.5 | 0.0 | .. | 0.115 |
| | | 48 | 27.0 | 20.7 | 14.2 | 6.0 | 3.6 | 2.0 | .. | .. | .. | .. | 0.204 |
| 34 | Glycerol–phthalic anhydride | 0 | 74.5 | 55.1 | 23.8 | 9.3 | 3.1 | 2.4 | 1.2 | 0.1 | .. | .. | 0.078 |
| | | 48 | 20.7 | 16.6 | 8.6 | 2.8 | 1.3 | 0.7 | 0.1 | .. | .. | .. | 0.083 |
| 35 | Glycol–phthalic anhydride | 0 | 57.5 | 36.5 | 34.4 | 20.0 | 14.6 | 11.4 | 5.9 | 3.9 | 0.6 | .. | 0.063 |
| | | 48 | 36.5 | 29.2 | 27.5 | 11.3 | 7.9 | 5.8 | 2.3 | 0.6 | .. | .. | 0.066 |
| 37 | Glycerol–phthalic anhydride | 0 | 81.3 | 75.3 | 54.1 | 42.2 | 26.9 | 23.8 | 15.2 | 10.2 | 1.5 | .. | 0.071 |
| | | 48 | 47.9 | 37.7 | 26.5 | 14.8 | 9.3 | 8.4 | 4.5 | 1.4 | .. | .. | 0.077 |
| 36 | Glycerol–phthalic anhydride | 0 | 81.2 | 68.4 | 63.7 | 32.1 | 26.1 | 23.0 | 13.3 | 10.2 | 1.5 | .. | 0.028 |
| | | 48 | 52.8 | 38.4 | 28.3 | 16.5 | 12.4 | 10.2 | 6.8 | 1.7 | .. | .. | 0.037 |
| 1 | Glycerol–phthalic anhydride | 0 | 82.0 | 70.5 | 61.0 | 42.3 | 36.2 | 32.7 | 23.2 | 6.7 | .. | .. | 0.054 |
| | | 48 | 44.8 | 33.9 | 24.3 | 4.2 | .. | .. | .. | .. | .. | .. | 0.111 |
| 32 | Coumarone-indene | 0 | 81.6 | 55.1 | 45.0 | 23.0 | 17.2 | 14.9 | 8.1 | .. | .. | .. | 0.109 |
| | | 48 | 15.3 | 10.8 | 8.3 | .. | .. | .. | .. | .. | .. | .. | 0.316 |
| 33 | Coumarone-indene | 0 | 81.4 | 60.9 | 39.1 | 17.3 | 13.2 | 11.6 | 7.6 | 3.9 | .. | .. | 0.133 |
| | | 48 | 17.7 | 12.8 | 9.08 | .. | .. | .. | .. | .. | .. | .. | 0.182 |
| 31 | Coumarone-indene | 0 | 74.6 | 65.0 | 44.8 | 24.7 | 20.7 | 17.9 | 12.0 | .. | .. | .. | 0.050 |
| | | 48 | 19.5 | 16.4 | 13.0 | .. | .. | .. | .. | .. | .. | .. | 0.250 |
| 24 | Coumarone-indene | 0 | 78.5 | 74.8 | 64.8 | 37.1 | 31.3 | 27.7 | 15.5 | 2.5 | .. | .. | 0.035 |
| | | 48 | 41.3 | 37.1 | 25.6 | .. | .. | .. | .. | .. | .. | .. | 0.333 |
| | Class II–A: | | | | | | | | | | | | |
| 30 | Water-white rosin | 0 | 72.1 | 61.2 | 53.9 | 34.4 | 29.8 | 27.0 | 18.3 | 8.0 | .. | .. | 0.049 |
| | | 48 | 67.2 | 59.0 | 46.1 | 26.7 | 22.2 | 20.0 | 11.1 | 1.3 | .. | .. | 0.052 |
| 27 | Congo gum | 0 | 76.0 | 58.5 | 56.5 | 55.2 | 51.7 | 47.3 | 43.0 | 40.8 | 37.9 | 32.4 | 0.036 |
| | | 48 | 68.8 | 52.4 | 46.4 | 22.9 | 20.2 | 16.4 | 12.3 | 10.4 | 8.19 | 4.75 | 0.055 |
| 26 | Manila gum | 0 | 73.3 | 70.5 | 56.6 | 52.2 | 50.6 | 49.4 | 40.0 | 22.8 | 16.2 | 5.5 | 0.034 |
| | | 48 | 63.6 | 54.5 | 48.6 | 38.5 | 38.5 | 31.4 | 26.6 | 18.1 | 14.5 | 5.3 | 0.068 |
| 25 | White shellac | 0 | 78.3 | 76.8 | 70.4 | 66.2 | 63.4 | 51.8 | 50.5 | 34.7 | 17.6 | 6.9 | 0.037 |
| | | 48 | 66.5 | 64.8 | 61 0 | 53.9 | 45.2 | 38,5 | 36.7 | 35.6 | 31.7 | 16.2 | 0.039 |
| 19A | Kauri gum | 0 | 79.2 | 77.8 | 75.3 | 63.0 | 59.1 | 57.5 | 50.3 | 41.0 | 28.2 | 15.4 | 0.023 |
| | | 48 | 78.5 | 77.0 | 71.6 | 59.3 | 55.4 | 53.7 | 44.6 | 34.6 | 25.4 | 13.3 | 0.089 |
| 18 | Dammar gum | 0 | 90.3 | 86.0 | 80.5 | 74.5 | 72.0 | 70.1 | 63.2 | 53.0 | 35.0 | 26.7 | 0.011 |
| | | 48 | 79.8 | 75.0 | 71.8 | 48.6 | 44.0 | 41.9 | 55.0 | 29.1 | 24.8 | 17.8 | 0.047 |
| A1 | Glycerol–phthalic anhydride oil resin | 0 | 94.6 | 92 | 77.2 | 29.1 | 11.2 | 3.0 | .. | .. | .. | .. | (b) |
| | | 48 | 86.9 | 86.9 | 73.8 | 35.8 | 10 | .. | .. | .. | .. | .. | ... |
| A2 | Glycerol–phthalic anhydride oil resin | 0 | 94.2 | 85.7 | 74.3 | 42.2 | 20.8 | 7.00 | .. | .. | .. | .. | ... |
| | | 48 | 91.6 | 86.7 | 75 | 86.7 | 11.2 | 7.8 | .. | .. | .. | .. | ... |
| A3 | Glycerol–phthalic anhydride oil resin | 0 | 98.6 | 97.5 | 95.5 | 88.5 | 61.7 | 35.4 | .. | .. | .. | .. | ... |
| | | 48 | 94.6 | 93.3 | 89.1 | 69.5 | 43.1 | 23.9 | .. | .. | .. | .. | ... |
| | Class II–B: | | | | | | | | | | | | |
| 17 | Vinyl acetate and vinyl chloride | 0 | 92.0 | 90.7 | 85.5 | 79.8 | 76.0 | 73.4 | 64.0 | 55.0 | 43.5 | 22.0 | 0.086 |
| | | 48 | 67.2 | 63.3 | 58.1 | 49.0 | 43.6 | 39.0 | 20.4 | .. | .. | .. | 0.300 |
| | Vinyl acetate | 0 | 99.0 | 98.3 | 97.6 | 97.0 | 95.8 | 95.2 | 92.3 | 87.4 | 78.0 | 59.0 | ... |
| | | 48 | 85.7 | 73.5 | 61.8 | 31.2 | 15.2 | 12.0 | 7.0 | 0.2 | .. | .. | ... |

[a] Indicates transmission too low to permit measurement.

[b] These results were taken from previous measurements made in the laboratory before the investigation proper was started and the films were destroyed before yellow index values could be determined.

# The World's Recent Progress in Synthetic Resins

## A complete and condensed account of patents from the most important industrial countries

*By Dr. Aladin*

*The patents that are listed here are all of recent origin and disclose the progress realized throughout the civilized world in this field. The dates, except in case of U. S. patents, are those of application. There will be a total of over 450 patents in this review. Publication began in April 1929.*

### 2. Preparation of Phenol-formaldehyde Resins using Acid Condensing Agents

*(Continued from June Issue)*

| Serial No. | Patent Number and Date | Inventor or Assignee | Title of Invention | Subject Matter of Invention |
|---|---|---|---|---|
| 62 | Brit. Pat. 261 522 10-12-1925 | Chem. Fabriken Dr. Kurt Albert | Preparation of resinous condensation products from phenols and aldehydes. | See U. S. P. 1,614,172 (No. 43). |
| 63 | Brit. Pat. 267,901 | Kunstharzfabrik Dr. F. Pollak | Phenol-aldehyde condensation products. | See French P. 630,086 (Np. 72). |
| 64 | Brit. Pat. 276.417 5-20-1926 | Bakelite Corp. | Fluid coating materials. | 7.5 mols of phenol are condensed with 6 mols of hexamethylene-tetramine and the resulting soluble product is thereupon dissolved in double its quantity of sodium hydroxide solution and condensed with 3.5 mols of furfural. The product is a soluble resin useful as a lacquer base and for impregnating purposes. |
| 65 | Brit. Pat. 280.520 10-27-1927 | H. L. Bender (Bakelite Corp.) | Phenolic Resins. | 2 mols of phenol are condensed in an alkaline medium with 6 mols of formaldehyde and the product is boiled down in vacuo, whereupon up to 3 mols of urea, thiourea or p. toluensulfonamide are added and the final condensation then carried out with an acid catalyst such for example as lactic acid, boric acid or phosphoric acid. |
| 66 | Brit. Pat. 281,537 5-17-1927 | A. Jager (to Herred A.-G.) | Preparation of a white horn substitute. | A phenol is condensed with 22—3 parts of a 30% formaldehyde solution using sodium stearate as a condensing agent. The resin is dehydrated in a vacuum. At a temperature of 55° C. there are then added 1.8 mol of salicylic acid for each mol of the sodium stearate used and the product is then heated further to 75° C. until the resin is no longer adhesive in nature. It is finally hardened at between 80 and 90° C. in molds. |
| 67 | Brit. Pat. 293,436 11-21-1927 | T. E. Basset | Plastic Masses. | Cresol and formaldehyde are combined in a soda solution. To the first condensation product there is then added the albuminous products resulting from starch manufacture and the condensation is continued yielding insulating materials and the like. |
| 68 | Fr. Pat. 596,071 2-3-1925 | Chem. Fabriken Dr. Kurt Albert | Resinous condensation products from phenols ketones and aldehydes. | See U. S. P. 1,614,172 (No. 43). |
| 69 | Fr. Pat. 596.072 2-3-1925 | Chem. Fabriken Dr. Kurt Albert | Preparation of fluid or crystalline phenolic condensation products from mono-or dicylcic phenols. | See U. S. P. 1,614,171 (No. 42). |
| 70 | Fr. Pat. 610,107 1-15-1926 | A. Regal | Preparation of resinous phenol-formaldehyde condensation products using a catalyst. | See German P, 442,361 (No. 56). |

| Serial No. | Patent Number and Date | Inventor or Assignee | Title of Invention | |
|---|---|---|---|---|
| 71 | Fr. Pat. 620,169 8-6-1926 | P. Carpentier | Manufacture of glasslike products. | A solution of casein in sodium carbonate is introduced into molten phenol. Sodium salicylate is then added, and after everything has passed into solution, formaldehyde is then added. The product is filtered to remove any undissolved particles and is then heated under a reflux condenser. Finally about 80% of the water present is distilled off and the residue cast into open molds which are heated to 100° C. until finally a glass-like insoluble product results. |
| 72 | Fr. Pat. 630,086 3-2-1927 | Kunstharzfabrik Dr. F. Polak | Phenol-formaldehyde condensation products. | Phenol or cresol are condensed with 2½ mols of formaldehyde with the addition of sufficient alkali to retain the resultant resin in solution. It is also possible to work first with an acid condensing agent and then to continue in an alkaline medium. In either case further condensation is carried out after the alkali has been neutralized with an halogenated fatty acid. Dehydration is then effected. On further heating an insoluble resinous product, very resistant to changes by light, is obtained. |
| 73 | Fr. Pat. 638,887 12-27-1926 | G. Bia and J. E. Donzal de Granville de Bielize | Plastic Dielectric materials. | Plastic materials that may serve as substitutes for horn or ivory are obtained when phenol or cresol is condensed with from 1½ to 2½ parts of 40% formaldehyde in presence of basic catalysts such as magnesium oxide, soda, borax, sodium caseinate or calcium caseinate; paraffin also being present. The alkali is finally neutralized with an excess of an acid such as salicylic acid, acetic acid or boric acid and the product evaporated down and finally hardened under pressure. |
| 74. | Fr. Pat. 643,438 11-7-1927 | H. L. Bender (Bakelite Corp.) | Phenolic Resins. | See Brit. P. 280,520 (No. 65). |
| 75 | Norw. Pat. 41,228 5-13-1924 | W. Tod Jr. & Co. | Phenol-formaldehyde condensation products. | Waste products from esparto paper manufacture, which contain oxycellulose, are employed as catalysts in the preparation of phenol-aldehyde condensation products, calcium oxychloride serving as an additional catalyst. |
| 76 | Austrian P. 101,628 | H. Bucherer | Preparation of soluble derivatives of the resinous condensation products of phenols and aldehydes. | The condensation products made in accordance with German Patent 391,-072 are employed. The still open grouping of the products is converted into closed-ring formation by employing aldehydes or preferably such substances as possess alkyl or acidyl groups, such as CO. CS. CO. CO.;— $CH_2$-CO; or $CH_2.CH_2$. The products are insoluble and infusible. |
| 77 | Austrian P. 109,678 | Bakelite Ges. | Preparation of pure phenol-formaldehyde condensation products. | In contradistinction to the same company's main patent, the usual alkali condensing agents are replaced by oxides or hydroxides of the alkaline earth metals (such as magnesium and aluminum), or else by compounds of metals capable of reacting with the phenol. The resins are obtained, after condensation, by precipitation with water or with solutions of salts exerting by hydrotropic action. The products are relieved of their excess phenol by treatment with a solution or suspension of calcium hydroxide, such solution then serving as the starting point for the manufacture of further condensation products.— |

## c. Phenol-formaldehyde condensation products made with Neutral Condensing Agents

| Serial No. | Patent Number and Date | Inventor or Assignee | Title of Invention | |
|---|---|---|---|---|
| 78 | U. S. P. 1,472,353 | J. G. Byrom and B. Attwater | Phenolic Condensation products. | Neutral thiosulfates are used as catalysts. |
| 79 | U. S. P. 1,632,113 | A. L. Brown (to Westinghouse Electric & Mfg. Co.) | Phenolic Condensation products. | Lead or manganese resinates are employed as catalysts to effect the condensation of phenols or cresols and formaldehyde. Salt of other fatty acids may also be used, the condensation being in any case carried on at not over 90° C. On evaporation a soluble resin results, suitable for impregnating purposes. |
| 80 | U. S. P. 1,633,976 | A. L. Brown (to Westinghouse Electric & Mfg. Co. | Preparation of Elastic Products. | One mol of phenol or cresol is condensed with 1 mol of formaldehyde or its polymers in presence of from 15 to 25% of a drying oil, such as China wood oil, the catalyst being about 2% of a lead or manganese resinate or the corresponding salt of a fatty acid of high molecular weight. The product, which is solubit in benzene or an alcohol-benzene mixture serves as an impregnating medium. See also U. S. P. 1,632,113 (No. 79). |
| 81 | U. S. P. 1,640,562 | A. L. Brown (to Westinghouse Electric & Mfg. Co.) | Varnish from a condensation product. | 1-2 parts of cresol are mixed with 3 parts of China wood oil and about 30% of the weight of the cresol of trioxymethylene, the mixture being heated for some time under a reflux condenser at 100-110° C. The resulting resin is dehydrated at 120° C. and then heated to 200° C. in admixture with 3% of cobalt linoleate dryer. When mixed with turpentine or benzene etc. a drying-varnish is obtained from the product. |
| 82 | U. S. P. 1,643,447 | E. J. P. C. de Tarny | Phenol-formaldehyde condensation products. | See French addition 30,787 to Fr. P. 563,777 (No. 99). |
| 83 | U. S. P. 1,680,408 | A. L. Brown (to Westinghouse Electric & Mfg. Co. | Preparation of condensation products. | Cresol is condensed with aqueous formaldehyde in presence of China wood oil or similar vegetable oil. The resin when dissolved in benzene, toluene etc. may be used as a varnish. |
| 84 | Can. Pat. 237,679 | W. Achtmeyer | Phenol-formaldehyde condensation products. | Phenols are first condensed with methylenediphenyldiamine (which is obtained from anilin and formaldehyde by condensation) and the resultant oil products are then heated further with paraformaldehyde, yielding an insoluble resin. |
| 85 | Can. Pat. 240,528 | W. Achtmeyer | Phenol-formaldehyde condensation products. | Phenols and formaldehyde or its polymers are condensed in presence of sodium tungstate as a condensing agent, with or without the further addition of a fireproofing agent such as sodium phosphate. |
| 86 | Can Pat. 258,608 | S. Karpen Bros. | Preparation of resinous condensation products from phenols and formaldehyde. | Soluble resins may be obtained from phenol by heating the same with the products resulting from the treatment of methylene chloride with aqueous ammonium hydroxide, the intermediate product being hexamethylenetetramine and ammonium chloride. |
| 87 | Can. Pat. 262,136 | A. Regal | Preparation of resinous condensation products from phenol and formaldehyde. | Use of ozone or ozonides as catalysts. |

# Technical Abstract Section

## A Concise Review of Patents and Literature

**Light-colored coumarone resins.** Irvin H. Jones, assignor to the Koppers Co., Pittsburgh, Pa. U. S. P. 1,684,868; Sept. 18, 1928.

The process of making light colored coumarone resin from solvent naphtha, which comprises subjecting the solvent naphtha to a preliminary polymerizing treatment to polymerize resin-darkening bodies therein distilling the naphtha to separate it from the solution, carefully fractionating the naphtha to eliminate substantially all traces of its resin-darkening and resin-softening constituents having boiling points below about 145° C. and above about 205° C., and thereafter subjecting the naphtha so treated to a resin polymerizing treatment.

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**Chromium-plated dies for molding cellulose ester compositions.** Kevie W. Schwartz, assignor to United Chromium, Inc., New York. U. S. P. 1,688,060; Oct. 16, 1928.

The method of finishing cellulose derivative products and the like, comprising subjecting the same to contact between tools or implements having a chromium surface.

The method of making articles containing nitrocellulose which comprises producing a solution of the material of which the article is to be composed, contacting said solution with a chromium surface of proper shape to form the desired article and evaporating the solvent.

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**Resinous material from xylenols, magnesium oxide and formaldehyde.** Carleton Ellis, of Montclair, New Jersey. U. S. P. 1,691,271; Nov. 13, 1928.

Example 1.—100 parts by weight of ordinary commercial coal tar acids containing about 8 per cent of phenol, 65 per cent of ortho cresol and 27 parts of metaparacresol were mixed with 120 parts of ground magnesium-formaldehyde mixture prepared by grinding in pebble mill 30 parts of calcined magnesium oxide and 150 parts of aqueous 40 per cent formaldehyde solution. 200 parts of saturated brine were added to this mixture and the whole was allowed to stand in the cold, with slow agitation until all formaldehyde was consumed. The end of the reaction was determined by fuchsine reagent, considering the end point when coloration did not appear within 30 seconds after addition of the reagent to a sample of water layer. When the reaction was terminated the water layer was decanted and 100 parts of residual resinous mass (containing about 8 per cent of water) were thoroughly mixed with 54 parts of powdered plaster of Paris. The resin, thus dehydrated, was mixed in pebble mill with 100 parts of wood flour containing 2 parts of aluminum palmitate and 2 parts of carbon black.

1. The process which comprises reacting together a crude xylenol and a magnesium formaldehyde jelly, agitating at room temperature until the formaldehyde has combined, and separating out the water.

3. A molding composition comprising a thermo-setting resin derived from xylenol, magnesium oxide and formaldehyde.

4. A magnesium xylenate resin composition.

5. A magnesium xylenate resin heat-setting molding composition.

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**Condensation Products of urea and formaldehyde.** Henri Barthelemy, assignor to Société Industrielle Des Matieres Plastiques, of Paris, France. U. S. P. 1,691,427; Nov. 13, 1928.

1. A process of manufacturing condensation products from urea and formaldehyde, comprising the step of treating a syrupy solution of the initial condensation product of urea and formaldehyde with an organic anhydride of the aliphatic series.

2. A process of manufacturing condensation products from urea and formaldehyde, comprising the step of treating a syrupy solution of the initial condensation product of urea and formaldehyde with an organic anhydride of the aliphatic series in the presence of an agent which will retard the transformation of the anhydride into acid.

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**Process of making dipolymer from pine oil.** Irvin W. Humphrey, assignor to Hercules Powder Company, of Wilmington, Delaware. U. S. P. 1,691,573; Nov. 13, 1928.

Dipolymer, is a product, consisting of polymerized terpene hydrocarbons, which is obtained by polymerizing dipentene, turpentine or pine oil. Although it is largely composed of the Dipolymer $(C_{10}H_{16})_2$, substantial proportions of higher polymers, $(C_{10}H_{16})n$, are generally present. Dipentene, as the term is herein employed, refers to the cut of pine products boiling largely between 165 and 185° C., which is obtained in the steam distillation of pine wood. Pure dipentene boils at 174-6° C., but the term dipentene as herein used is intended to comprehend the crude product with the wider boiling range.

For example, 400 parts of pine oil are heated with 100 parts of fuller's earth in a bath held at 160-170° C. for eight hours. After cooling, the product is filtered from the fuller's earth and then distilled, 125 parts distilling below 250° C. The residue is Dipolymer. A portion of the lower boiling fraction can be converted into Dipolymer by again treating it with fuller's earth, but a large proportion of non-polymerizable hydrocarbons, including para-cymene, is present. The bath may be held at higher temperatures in order to decrease the period of heating. The pine oil may be refluxed with the fuller's earth.

1. The process of preparing Dipolymer from pine oil which includes heating pine oil to a temperature in excess of 200° C. and below a temperature of 550° C. for a sufficient length of time to effect dehydration and finally polymerization of a substantial part of the pine oil vapors to form "Dipolymer."

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**Manufacture of Cellulose Acetate.** James William Bulmer, of Cullingworth, England. U. S. P. 1,692,622; Nov. 20, 1928.

100 lbs. of cellulose of the type usually acetylated are impregnated with 750-850 lbs., of acetic acid of 98 per cent strength in a suitable container having a device for lowering the temperature to that at which the acetic acid crystallizes. After crystallization has occurred throughout the mass the latter may receive, at the same temperature or after the temperature has been allowed to rise, the acetic anhydride and condensing agent required for acetylation.

A process of preparing cellulose for acetylation which consists in mixing the cellulose with acetic acid of such strength that the acid crystallizes when cooled and then cooling the mixture until crystallization of the acid has occurred throughout the mass.

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**Phenol resin containing furfural.** Frazier Groff, assignor to Bakelite Corporation, New York, N. Y. U. S. P. 1,693,112; Nov. 27, 1928.

A mixture of phenol and furfural in about molecular proportions is heated in presence of an alkaline condensing agent to a temperature of 110°-160° C. Suitable condensing agents are sodium hydroxid or carbonate, the oxids or hydroxids of calcium and magnesium, pyridin, hexamethylenetetramine, etc. The duration of the heating may be widely varied, as from 1 to 10 hours, but should be so limited as to avoid gelatinization of the mixture. At the conclusion of this operation the desired amount of non-reactive phenol-methylene or essentially similar resin is added, and the heating continued at about 145-150° C. until the resin forming reaction is sufficiently advanced, and the mixture is thoroughly dehydrated. It is possible that some reaction may occur at this stage between the fusible resin and the furfural, but if so this is secondary to the main reaction between the phenol and the furfural. Hexamethylenetetramine in proportion to impart a reactive character to the phenol-

methylene resin is then added, together with the necessary constituents of the complete molding mixture as already described.

2. Process of making a dehydrated reactive resin composition, comprising reacting a phenol with furfural in proportion to yield an infusible resin, arresting the reaction before the infusible stage is reached, adding thereto a non-reactive phenol-methylene resin, heating the mass to dehydrate the resin and further advance the same, and adding a methylene-containing hardening agent.

6. The hereindescribed reactive resin composition, comprising a dehydrated mixture including a reactive phenol-furfural resin, a non-reactive phenol-methylene resin, and a methylene-containing hardening agent for the latter.

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**Polyglycols as plasticizers for cellulose derivatives.** Joseph G. Davidson, assignor to Carbide and Carbon Chemicals Corporation of New York. U. S. P. 1,693,746; Dec. 4, 1928.

1. A new composition of matter containing a cellulose derivative of the ether-ester class and a solvent therefor comprising a polyglycol.

5. A new composition of matter containing nitrocellulose and a solvent therefor comprising a polyethylene glycol having a plurality of ether linkages.

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**Impregnating Solution Containing Phenolic Resins and Furfural.** Lawrence V. Redman and Harold C. Cheetham, assignors to Bakelite Corp., New York, N. Y. U. S. P. 1,693,939; Dec. 4, 1928.

A potentially reactive phenolic resin composition, comprising for example a fusible phenol resin with which has been incorporated, say, 5-15 percent of a methylene-containing hardening agent, as hexamethylenetetramine, is dissolved in furfural, using such proportions of the solvent as are required to give a solution of the desired concentration and viscosity for the particular purpose in view. For example we may use 20 to 60 parts by weight of furfural per 100 parts of resin, although our invention is not restricted to these proportions. Preferably the object to be impregnated is subjected to vacuum to remove the contained air, and the solution is permitted to impregnate it, either throughout the mass or to the extent desired, as readily controlled by the viscosity of the solution and the time permitted for the impregnation. The impregnated object is then, either with or without further shaping, heated to a sufficient temperature, say 125°-150°, until the transformation of the potentially reactive resin composition to its infusible state is accomplished.

We claim:

1. An impregnating solution comprising a potentially reactive phenolic resin capable of setting free ammonia during its transformation to the infusible state, and furfural in proportion at least sufficient to combine with the liberated ammonia.

2. An impregnating solution comprising a potentially reactive phenolic

resin capable of setting free ammonia during its transformation to the infusible state, and furfural in substantial excess of the proportion required to combine with the liberated ammonia.

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**Manufacture of cellulose ethers.** Otto Leuchs and Eduard Dorr, assignors to I. G. Farbenindustrie Aktiengesellschaft, of Frankfort-on-the-Main, Germany. U. S. P. 1,694,127; Dec. 4, 1928.

Alkali cellulose and ethyl-chloride are heated in the customary manner in a stirring autoclave in the upper part of which however a perforated vessel is placed, which is charged with solid caustic soda. At the commencement of heating the autoclave the ethylchloride first reacts with the alkali cellulose, while simultaneously water is abstracted from the reaction mixture owing to the presence of solid caustic soda in the vessel placed above. The caustic soda commences gradually to pass into solution on account of the absorbed water ,it then drops down into the alkylating mixture, and thus replaces the caustic soda solution, which meanwhile has been used up in the reaction between the alkali cellulose and the ethyl-chloride. In this manner caustic alkali is automatically introduced to the alkali cellulose during the course of the reaction. The quantity of alkali in the vessel placed above can be so arranged that the alkali passes completely into solution, or that it is present in excess, that only a part of the same dissolves; or the process may be effected in such a manner that yet a second vessel is arranged in the upper part of the autoclave, which is charged with a drying agent, such as for example, with calcium chloride.

1. In the process for the manufacture of cellulose ethers, the step which comprises the removal of water during the etherification and the addition of caustic alkalies to the alkylating mixture.

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**Producing condensation products from crude cresol and acetone.** Hans Jordan, assignor to Chemische Fabrik Auf Actien, Vorm. E. Schering, of Berlin, Germany. U. S. P. 1,696,769; December 25, 1928.

The method of recovering separately the constituents from a mixture of the products obtained by condensation of crude cresol and acetone, comprising dissolving the product in ether and separating the m-cresol acetone condensation product which has crystallized out.

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**Bakelized Armature Coil.** William L. Neely, assignor to Westinghouse Electric and Manufacturing Co. U. S. P. 1,697,134; Jan. 1, 1929.

3. An armature coil-side comprising a plurality of insulated conductors wound to a predetermined shape and impregnated with wax, an inner covering of flexible, wax-impregnated insulating material closely surrounding said coil-side, and a casing of hardened impregnated material surrounding said flexible material and holding the same in place, said hardened cas-

ing being compressed to a predetermined shape.

5. The method of preparing form-wound armature coils which consists in wrapping the form-wound coils with an impregnable insulating tape, soaking the coil thus formed in wax, covering the coil-sides with a second impregnable wrapping of insulating tape, impregnating said second insulating covering with an insulating material which hardens under heat and pressure, and subjecting said second impregnated covering to a heat and pressure treatment for hardening the same holding the coil-sides in shape.

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**New derivatives of the condensation products of Aldehydes and Phenols.** Hans Bucherer, of Charlottenburg, Germany. U. S. P. 1,697,713; January 1, 1929.

100 kg. of the condensation product obtained from formaldehyde and cresol, (technical mixtures of the three isomers) are dissolved in a sufficient quantity of dilute alkali (at least an equivalent) and thereupon treated with 100 kg. of calcined soda. The solution is preferably heated to between 70 and 100°C. and gradually para-toluene-sulpho-chloride is added until the original condensation product has disappeared from the alkaline solution except for small traces. The toluene sulpho-acid ester is separated out in the form of a resin which solidifies on cooling, and is fairly soluble in cold benzene. Instead of obtaining the ester in the above mentioned manner it may also be obtained by mixing together the condensation products and the amount of toluene sulpho-chloride in the amounts required and introducing this mixture in dilute alkali solution heated to about 70 to 100° C. In the last case prolonged heating must be avoided in order to prevent subsequent decomposition of the ester by an excess of alkali.

Finally the ester may also be formed, in the absence of water, by the action of toluene sulpho-chloride upon the sodium salt of the condensation products, or by subjecting the aldehyde resin in an inert solvent or diluent, in the presence of calcined soda, to the action of the sulpho-chloride.

1. The process for the production of new derivatives of resinous condensation products of aldehydes and phenols containing hydroxyl groups, consisting in reacting on such condensation products with halogenous organic compounds, containing halogenous atoms capable of chemically reacting to cause the organic residue combined with the halogen in such compounds to replace the hydrogen of the hydroxyl groups in such products.

8. As a new composition of matter the derivatives of condensation products of aldehydes and mono-valent phenols chemically condensed with chemically reactive halogenous organic compounds, substantially as described.

## Unusual Applications of Plastics

(*Continued from page 438*)

fore the winding to increase its lubricating qualities. The same result may be obtained by coating the exterior of the material after molding. The assembly is cured in a mold of uniform diameter so that the material that bulges over the disk is compressed.

L. T. Frederick in Patent 1,475,764 dated November 27, 1923 makes a barrel from paper pulp and a phenolic material. The paper pulp is deposited upon a core made of a close mesh screen and of the same shape as the finished article; subjected to heat and pressure sufficient to volatilize its liquid content and compact the pulp; removed from the core; impregnated with a resinoid and molded with heat and pressure in the usual manner.

### Chemical Apparatus

W. O. Kennington in Patent 1,218,568 dated Mar. 6, 1917 suggests making a container for chemicals composed of Condensite and lined with hard rubber. Chemical vessels and apparatus as well as bottles are disclosed by H. C. Egerton in Patent 1,504,547 dated Aug. 12, 1924. Egerton's method consists in forming or winding fibrous materials such as cotton batting, woven or knit cloth or paper carrying or impregnated with cured phenol condensation product on a core of fusible metal, waxy or resinous composition. An elastic or impervious facing of vulcanized rubber or of muslin having a vulcanized rubberized layer on one side and an unvulcanized layer on the other may previously have been formed on the core. Reenforcements such as compressed pieces of fibrous material such as cotton or linen carrying phenolic condensation product or perforated or other sheet steel or metallic stiffening members may be incorporated into the material as it is wound on the core. The assemb-

ly is placed in a mold and the core subjected to high fluid pressure to force the layers of fabric against the mold. After the molding is completed, the core is melted and drained out. Other hollow articles such as propellers and float balls may be made in substantially the same manner.

### Fuses and Flash Lights

In Patent 1,500,221 dated July 8, 1924 R. C. Benner suggests making the casing of a flashlight storage cell of a resinous phenolic condensation product. W. O. Snelling in Patent 1,561,366 dated November 10, 1925 prevents the "side-splitting" tendency of fuses by covering the ordinary paper core with two layers of paper and an intermediate layer of phenolic varnish. The first layer is wrapped in the form of a tube and the second layer is spirally wound. The heat of the burning core will cure the varnish.

### Casting Box

An application somewhat analogous to a container at least in form if not entirely in function is a casting box such as is described by E. E. Novotny in Patent 1,357,343 dated November 2, 1920. One form of the casting box described consists of two companion members made from hard and set metal reenforced phenolic condensation product and having both a heating element and a cooling coil embedded therein adjacent to each other, the two companion members being separated from each other by a core plate consisting of a metallic frame embracing a body of plastic material such as a phenolic condensation product.

*This article will be continued in the September issue.*

## Casein-Furfural-Ester Plastics

(*Continued from page 440*)

a cellulose ester, such as cellulose acetate, cellulose nitrate, etc., is brought into solution with any suitable synthetic res-

in, preferably a phenolic condensation product, such as may be produced from phenol and hexamethylenetetramine or from phenol, an aldehyde and a suitable catalyst, such as sodium carbonate, hydrochloric, oxalic or acetic acids, etc. by means of an appropriate solvent, such as furfural, or a combination of solvents, such as furfural and phenol, to produce an insulating material having the aforementioned desirable qualities.

For instance, cellulose acetate, 30 parts by weight is dissolved in a mixture of furfural, 300 parts by weight, and phenol, 15 parts by weight. A phenolic resin, such as "Redmanol 200-A", 10 parts by weight, is dissolved in a mixture of denatured alcohol, 100 parts by weight, and acetone, 250 parts by weight. The acetonealcohol solution is then thoroughly mixed with the cellulose acetate-furfural-phenol solution.

### Acetate, Furfural and Phenol

It is also possible to form the synthetic resin in the insulating solution directly, by adding the proper ingredients and then subjecting the mixture to a requisite heat treatment. When this method of preparing the material is followed, cellulose, acetate, 30 parts by weight, phenol, 15 parts by weight, hexamethylenetetramine, 2.5 parts by weight, and furfural, 300 parts by weight, are mixed together and heated at a temperature around 115° C. for a period of from two to four hours.

A quantity of camphor equal to the weight of phenol may be added, this ingredient tending to increase the elasticity and smoothness of the insulating coating. In place of camphor, "Halowax," triacetin, phenacetin, or tri-phenyl phosphate may be employed.

## Window Guides

(*Continued from page 441*)

of the glass.

If desired a thin flexible metal reinforcing sheet may be embodied in the rubber strip is indicated at 9 in Fig. 5. Such metal strips may be readily in-

corporated in the rubber by providing an extruding machine having a die head which enables the metal strip to be passed through the die opening and the rubber to be extruded around it.

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## Pyroxylin as an Imitative Material

(*Continued from page 442*)

to heat and pressure in order to cause the piled sheets to unite in the contacting surfaces thereof into a homogeneous mass, cake or block. This block is then sheeted into sheets of the desired thickness for use in the manufacture of various articles of commerce. The article resulting from this process is claimed in patent 1,607,624 dated Nov. 23, 1926.

### Producing Iridescence and Sheen in Imitation Mother-of-Pearl

In patent 1,607,622, Nov. 23, 1926 a base body of a suitable plastic material, whether translucent, transparent or opaque is employed. A pyroxylin compound, such as celluloid, is suitable for this purpose. The surface of the base body is then polished to a sufficiently high degree to render it capable of reflecting light impinging on it. Upon the polished surface of the base body is applied or deposited in any suitable manner a thin layer of material which is immiscible with the material of the base body. A thin film of gelatin answers the purpose. A convenient way of applying this layer is to deposit it from an aqueous solution.

After the layer of gelatin has dried thoroughly, the surface thereof is polished. For this purpose a basic halogen salt of bismuth, such as oxychloride, oxybromide, or oxyiodide of bismuth is employed. This halogen salt of bismuth in the form of a dry powder may be applied over the surface of the gelatin layer in any suitable or convenient manner. It is found to be

satisfactory to apply the salt with a soft rag, chamois, or the like. Apparently this operation not only levels, smooths and polishes the surface of the layer of gelatin or other material, but the minute cells, pores or recesses present in the layer structure or body become filled up with the halogen salt of bismuth employed, leaving the surface of the layer of gelatin or other material extremely brilliant. This also materially aids in rendering the gelatin non-permeable to the solvent of the thin transparent film when the latter is applied thereto. To this brilliant polished surface of the gelatin layer the thin transparent film of cellulose nitrate or acetate is applied.

The outer surface of the thin transparent film after being applied to the surface of the layer of gelatin is then carefully polished with one or another of the basic halogen salts of bismuth.

### Coating With Gelatin

The next operation is to apply a protective or fixing coating to the surface of the transparent film. The object of this operation is to protect against injury the thin transparent film, which is exceedingly fragile and very easily breakable. A coating of material which is immiscible with the material of the transparent film should be used for the protecting coating. A coating of gelatin deposited from an aqueous solution thereof will answer the purpose. If desired, the surface of this protecting coating of gelatin may in turn be protected, as, for instance, by hardening it, or rendering it insoluble. This may be accomplished in many different ways, as by subjecting the surface of the protecting coating of gelatin to the action of formaldehyde vapors, or by dipping it into a weak solution of formaldehyde, or the desired results may be attained by applying to the surface of the protecting film a thin coating of lacquer or varnish. This completes the stage of producing the irridescent effect in a fixed and stabilized condition capable of being utilized commercially.

The resulting product may be either a composite sheet, which can be stamped or blanked out into sections to be incorporated into any desired article of manufacture, or the operations above described may be carried out upon a mass of original plastic material which itself has been formed into the required shape to make an article of manufacture.

### Merely Reflection

A characteristic of this product is that no pigment or coloring matter is employed, the iridescence or changeable color effects being obtained solely from the effects of light reflection and refraction, the intensification of such reflection and refraction, and the interference of the reflected and refracted rays. This produces imitation mother-of-pearl diffused or sheen effect produced as above described. For this purpose the dehydrated pigment obtained from fish scales in the form of microscopically small particles presenting a brilliant silvery appearance, is suspended in a liquid which is miscible with plastic pyroxylin compounds such, for instance, as celluloid. Acetone or alcohol are suitable liquids within which such suspension of fish scale pigment may be effected. This liquid compound is mixed into a plastic pyroxylin compound preferably under heat and pressure. This can best be accomplished, according to present practice, by incorporating the suspended fish scale pigment into the pyroxylin compound dough during the manipulation of the latter in the process of its manufacture. It is preferable to introduce the suspended fish scale pigment at the very end of the rolling operation to which the plastic pyroxylin compound is subjected in the ordinary process of its manufacture. It is important to apply the minimum amount of rolling action to the plastic compound after the introduction of the fish scale pigment, in order to avoid altering or changing the delicate physical structure of the organic fish scale pigment. The application of heat to the plastic pyroxylin compound during the introduction of the fish scale pigment is also important, as it maintains the pyroxylin compound in a plastic condition, rendering it permeable to the liquid or vehicle carrying the fish scale pigment in suspension. The pressure exerted upon the plastic and softened pyroxylin compound causes the pigment to be forced into the body of the compound and dispersed indiscriminately therein. After the introduction and incorporation of the fish scale pigment into the body or mass of the plastic pyroxylin compound, the plastic material is carried through the ordinary remaining steps for producing celluloid, for example.

The resulting product is characterized by the presence therein of irregular translucent streaks and blotches, presenting more or less of a mottled appearance imparting a diffused, sheen remarkably like that of natural pearl shell.

The next operation in carrying out the process is to combine the material possessing the imitation diffused sheen of pearl shell with the body to which has been imparted the iridescence of genuine mother-of-pearl. This can be accomplished in various ways. According to one method, the material having the diffused sheen effect may be employed and applied as a covering for the body which has been rendered iridescent, thereby obtaining the combined effects of the iridescence and diffusion. The material which has been made iridescent may have been originally shaped in the form of the article of manufacture, and the iridescent effect produced on such a blank. In that case a sheet which has been given the diffused sheen appearance of pearl shell is correspondingly shaped and applied over the iridescent surface as a covering thereof.

*Further parts of this review will be published in subsequent issues of PLASTICS.*

## Trade-Marks

**Sea-Pearl.** Fiberloid Corporation. Sheets of pyroxylin plastics. Claims use since 1928.

**Makalot.** Lubricant Laboratories, Inc. Phenolic resin molding composition. Claims use since Jan. 16, 1929.

**Plasticizers, by Paul Bary, see September issue.**

# MOLDED PRODUCTS

Devoted to the purchase, further use and merchandising of all manner of molded parts

Vol. 3 AUGUST, 1929 No. 8


# The Grass in the Phenolic Field Seems Greener

## A correspondent of Molded Products points out that some of the 'bright prospects' are only 'deep pitfalls'

"IF", says a member of the board, "we could get a name like Kodak", "If" says someone down the table, "We had a slogan as 'There's a Reason, "—and they really believe it would mean success.

"If" says the manufacturer making most anything, "We could use up the waste by-product" and reminds his listeners how gasoline was once a by-product of the oil companies and tells those gathered about his conference table, that it is up to them to find a use for the saw dust from their box factory. "Why couldn't it be used for something"? says he. "It cost us real money". And so his chemists, his engineers, his efficiency crew, his production men, all get busy. Sometimes, they make good; sometimes they don't.

The grass in the phenolic compound field, has looked so green, and possibly because they know so little about it, it has been tremendously tempting to the manufacturer with by-products. It almosts seems as if manufacturers had tried to develop by-products as an excuse to get into it. The getting in, has not been so hard, it is the getting by, that becomes difficult. As for instance, while wood flour is used in manufacturing phenolic condensation products (or to use the new two hundred and fifty dollar word) "Resoids", they must be made from a very definite grade of wood flour. This wood must be ground and pulxerized evenly. All moisture and foreign material must be removed. Its consistency as a finished product must be uniformly even. The manufacture of wood flour is more or less a hazardous business. It is a highly specialized undertaking, and this is just the first step of a box manufacturer's problem and when he has wood flour, he hasn't even begun.

### From By-product to Intermediate

The box plant uses many woods; wormy chestnut bases, yellow pine, etc. Imagine what the miscellaneous sawdust and shavings would be like as finished products. It might be flour and have a market, but it wouldn't make a satisfactory phenolic molding material. Certainly not a material that would compete in the market with those made by organizations specializing in the field, and our box man still has his resin to make or to buy. He has the difficult problem of blending and mixing colors and holding these colors to a definite degree of uniformity, and he is making the problem difficult by a mongrel breed of wood flour.

Just why the phenolic condensation products field has looked so rosy, is not overly hard to analyze. Phenolic products have made long and rapid strides, therefore it is reasoned there must be money in them.

"Look" says the box man; he is a good example and we may as well keep him in the picture for a paragraph or so; though he is but one of dozens who say, "There were a hundred million dollars worth of radio tubes sold last year. They all have molded bases. The automobile manufacturers are using tons of it, etc." It not only sounds big, it is big, but radio tubes which sold for four fifty in 1926 are today selling for seventy five cents. Like the automobile, they are in a considerably more competitive market than existed ten years ago, with the result that we buy lots more tube and automobile for less money,—The purchaser of phenolic compounds is also required a better product for less money.

Saw dust and shavings are a long way from wood flour, wood flour is a long way from molding compound, to say nothing of

marketing it, but assuming that the manufacturer with his subsiduary box does make an excellent compound, he is a long way from the successful selling of it.

No doubt a reason contributing to the awakened interest in phenolic compounds, is the fact that the industry was surrounded by patents and that many of these have recently expired, which together with the public's acceptance of so many molded numbers, has made the field very tempting now that the bars appear to be down and everyone with a formula or even a chemical knowledge, apparently concluded that their opportunity had arrived. How little these formulae mean and how much more is needed than a knowledge of chemistry, is being rapidly found out.

### The Problems of the Established Manufacturer

Given all the advantages of formulae, employing the best chemists available, maintaining engineering staffs, research laboratories, highly developed sales and advertising departments, having the accumulated knowledge of the industry, let us consider a few of the problems of the foremost manufacturers of phenolic compounds or resoids as they exists today.

These established organizations are not entirely free from trouble and though their record of accomplishment is a healthy one, they still face unsolved problems.

The demand for colors experienced in almost every field of manufacturing, forced phenol product manufacturers, to develop colors beyond the contemplated possibilities of a few years ago. The work is not yet complete but their records of experience and their successes alone, would be worth thousands of dollars to those considering the duplication of the work, to say nothing of the necessary time that must be consumed by the beginner to duplicate this work and then to do so at a manufactured cost sufficiently low to meet competition.

The object of the phenol plastics manufacturers in the field is to sell enough material so that they maintain continuous production. This means that they must discover new outlets for their products' use, that they sell in a wide range of markets, over a broad field, as otherwise seasonal activity or slow up in any one industry, will disrupt their production schedules. Obviously it is a difficult field for the little fellow.

Now let us see what has happened with the manufacturer who figured that it was economical to make his own molding compound and to sell any surplus that he might have. Manufacturers of course, tried this, but most of these manufacturers have given up. In the auto-

(*Continued on page 481*)

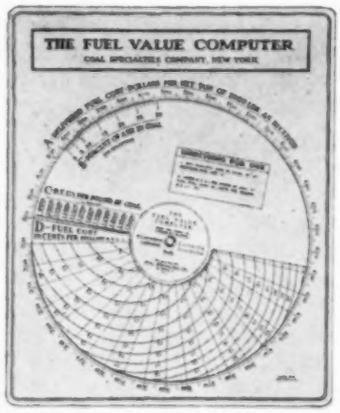
# Two New Useful Applications of Pyralin Sheeting

IN any department store the day before a big sale is a hectic one. The entire stock must be gone over and in many cases new price tags must be made up and attached. Anyone who has had a part in such a task knows that this preparation usually runs into the late hours of the night, in order to get the store ready to open its doors to the public in the morning.

To accomplish this work more satisfactorily, an ingenious price tag outfit, consisting of a set of changeable price tickets made of du Pont Pyralin, has recently been put on the market. It is easy with this equipment to make quick price changes without the usual delay that once seemed unavoidable in lettering new tags or the wastage involved in discarding old ones.

These tickets consist of a Pyralin frame imprinted with the store's name. The changeable figures are inserted in these frames and can be arranged to indicate any price from one cent to $999. Below the space reserved for prices, there is another place for changeable slides carrying special information, such as, "Reduced," "All Sizes," "Today Only," and the like. In the back of each ticket is an invisible clip holder by means of which the ticket can easily be fastened to the merchandise without injuring it.

The price tickets are compactly arranged for ready use




This device, made of Pyralin, enables you to determine the fuel value of coal

The tickets themselves are made in three colors — red, white and green. Further information about them may be obtained from the Novel Sales Corporation, 693 Broadway, New York City.

From producer to consumer, everyone who comes in contact with a ton of coal is interested in the amount of heat it is capable of producing. To sell this product intelligently, coal mining and distributing companies are constantly subjecting sam-

(*Continued on page 479*)

# Molded Sewing Box Makes Darning a Pleasure

## Neat Domart Box replaces old-fashioned sweet-grass basket that grandmother used

At Glenside, Pennsylvania which is just out in the country enough to be the right sort of a place to make sewing boxes, Mr. Haines located his novel business of making his all year "Mother's Day" sewing basket.

The Domart box is planned with a place for everything as shown in the accompanying illustrations. Nothing need be disturbed to get that little spool of pink silk, different from the old sweet grass basket of Grandmother's that it was necessary for her to empty into an ample white aproned lap and thus spread out the contents to find the needed article.

Domart has brought art and efficiency to this household utility. In fact, the jumbled and tumbled contents of two old-fashioned sewing baskets can be put conveniently and attractively into one Domart Sewing Box. The Domart is ever in readiness for instant use and it is characteristic of such molded articles that they last a life-time.

Domart boxes are nine inches in diameter, which is a comfortable fit for the crotch of the arm. They are molded of Walnut, Mahogany and mottled Green Durez and sold in the novelty and department stores at four dollars each.

Candy manufacturers have found them excellent numbers for the holiday and Mother's Day trade, making an attractive box as well as a permanent gift.

The Domart Sewing Box is one of the innumerable products that daily swell the ranks of molded articles. It is both beautiful and useful and far more enduring than the material it replaces. The limits of the possible applications of molded parts have not yet been approached. The alert manufacturer is keen to sense the sales value of a molded piece in his product.

# Pre-Testing Profits In Toiletware

## Two thousand women passed on artists' designs before new toilet articles were offered for sale

*By P. A. Dillman*

*Advertising Manager, Du Pont Viscoloid Co.*

WOMEN of today want and will buy, boudoir accessories that have been correctly designed to harmonize with the modern boudoir. This was conclusively proved last year by the success of du Pont Lucite . . . . an outstanding example of how the motifs of the great art periods can be successfully adapted to boudoir accessories and the charm of the original work still retained in the new articles.

The story of the creation of the new du Pont patterns for 1929 to cash-in on his vogue is probably one of the most interesting accounts of how a prominent company uses pure art sources in designing new patterns.

Out of scores of suggestions originally submitted by the Du Pont Staff of Stylists for new 1929 patterns, five were finally selected to be put on the market. Before being put into actual production, they were shown to over 2000 women — representing every station in life—in order to get a true cross-section of the tastes of women all over the country, and to check the artists' recommendations. This survey clearly showed that these new patterns will be purchased in volume by the consumer. It is, in effect, a pre-test of profits for the merchant, and removes the usual gamble in introducing new lines.

The five patterns which were finally chosen as logical additions to the Lucite line—are Watteau, whose delicate charm is extremely feminine and French, Wedgewood, whose graceful and formal design is like the famous Wedgewoodware, and Diane, whose classic and lovely simplicity was drawn from an ancient Greek vase. The Venetia design is as modern as the smart new furniture that you are beginning to see almost everywhere and the Crystal pattern, with a rich surface and delicate colorings, is unadorned and therefore particularly lovely in appearance.

All of these designs, with the exception of Crystal—whose shape and effect belong to every age, from ancient to modern—were selected because of their prominence in art history and popularity. Examining each pattern individually, we find many very interesting style notes in the various designs.

The Watteau Set

Adapted from an authentic design by the famous Josiah Wedgewood of 18th Century England, the Wedgewood pattern is sure to be popular with the younger set as well as those who appreciate fine, old period pieces. It was executed by Donaldson and blends well in rooms of almost any color scheme because of the neutral shade of its true Wedgwood blue tone. This is a pattern of which no one will ever tire because the beauty of Wedgewood has lasted through many years and it is a pattern which will always look like a treasure piece. It comes in three and five piece sets in new utility and gift box which may be kept on the dressing table, if desired.

The Watteau pattern was created by Nash in Oporto Red on old Ivory and red. Featuring a romantic garden scene in the style of the eminent French artist, Watteau, this pattern draws its inspiration from a period in French history when the boudoir dominated the interests of the artist and decorator. The richness of decorative effect, the garland-like composition and the dainty figures which make the paintings of Watteau's time so charming are reproduced in this Lucite pattern which make it a thing of beauty forever. People with an artistic nature will be particularly quick to appreciate the beauty of this pattern. Even the average person will be attracted to its richness of color. In four piece

The Wedgewood Set

sets only, Watteau also comes in a new gift and utility box.

In a beautiful shade of Coral Pink with silver and gold color decorations, the Diane pattern is suitable to those persons whose taste is conservative and who admire delicacy. The design adds a popular note to the patterns, so that even those who admire rich decoration will like the set. It was executed by Ethel Parsons of New York. The beautiful Coral Pink shade will offer a pleasing harmony with practically every color scheme. The decoration is an authentic adaptation of a Greek design from a vase of the Fifth Century B. C., the finest period of ancient Greek art, depicting Diani the Goddess of the Chase pursuing a fawn. In three and five piece sets Diane may be had in the new utility gift box.

**Venetia and Crystal Patterns**

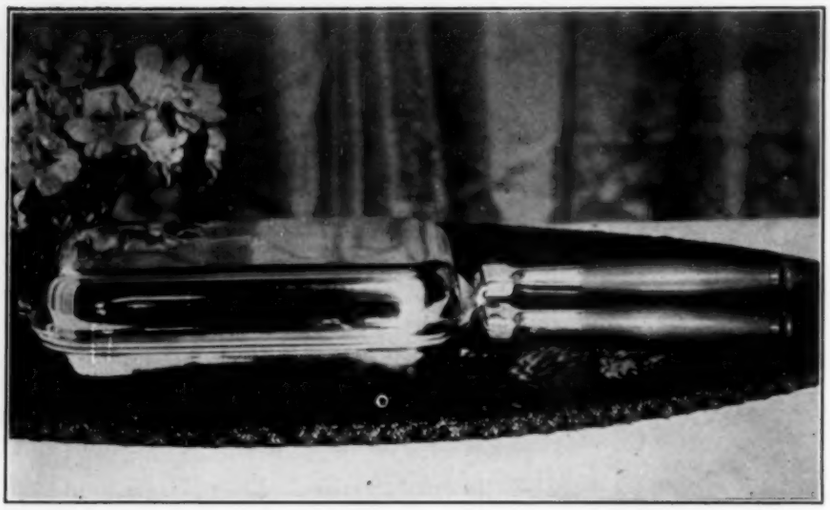
In Sea Jade and Mandarin Red, Venetia is distinctly modern in pattern, design and decoration and is styled to the hour. It is an ideal pattern for those who wish to add a cheery note of color to their boudoir. Venetia embodies simplicity, the best characteristic of today's art, and has beauty of line and treatment that is distinctly smart. In three and five piece sets Venetia also is obtainable in the new utility gift box.

For those who want the very finest, Crystal has been produced in three lovely hues — Sunset Rose, Golden Dawn and Mist Blue. Its distinctive characteristics will meet the demand for greater simplicity which has been on the increase with conservative people. Crystal is fashioned from an exquisite new Lucite material of a gleaming jewel-like beauty. Its design belongs to no period, but to all times—ancient and modern. Crystal comes in three and six piece sets.

In preparing the new creations for 1929, the du Pont Viscoloid Company followed the lines of its efforts last year—in employing a staff of stylists and artists who are specialists in the particular periods and are therefore competent to create authentic designs. The new sets cleverly combine the smart simplicity of modern design with the classic beauty of the past. People are not buying bizarre modernistic effects and these have been carefully avoided. Another new feature of the Lucite sets is the novel new gift box—with a mirror in the lid—which can be kept on the dressing table if desired. All of the new sets have been offered at lower prices than the original Lucite sets of 1928 in a carefully fixed range where experience has proven will bring the greatest volume of sales.

# Molded Device Serves Lighted Cigarettes

An ingenious Bakelite resinoid molding is the setting for the latest and perhaps the most ingenious device which has come to the aid of the automobile smoker. Invented by one Webb Jay, earlier known for his work on the vacuum tank fuel system, this cigarette dispenser is all but human. It contains cigarettes, dispenses them in an instant, lights them, and provides an ash receiver. More than this, the cigar smoker has not been forgotten. A contact ignitor is lodged at one side. When charged with the electric glow, this can be removed and passed to the occupants of the back seat, rumble, or what not.



Bakelite handles, durable, heat resistant, and attractive in design and finish, are an important item in the construction of this "two-in-one" omelet pan.

# Colored Molded Handles Brighten Up Kitchen Utensils

## Bakelite handles prove much more elegant and serviceable than wooden parts

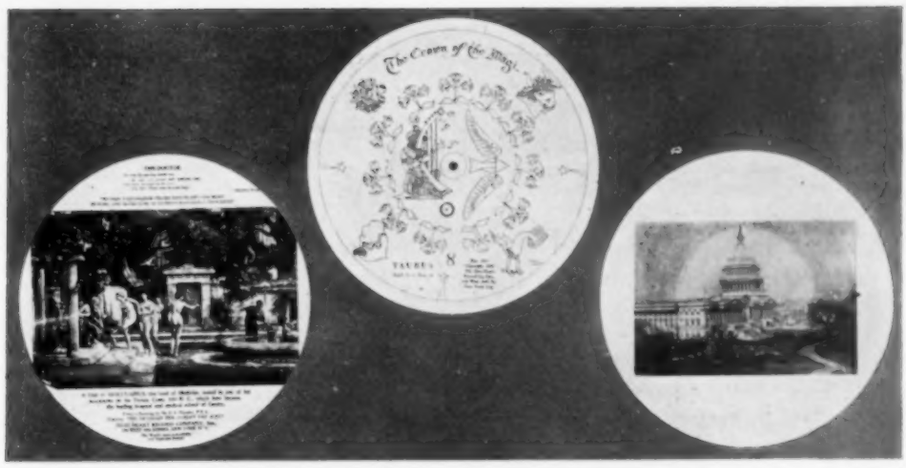
PROVIDING the handles for cooking utensils has always been a bit of a problem. In the stone age, the handle of the crude skillet was durable to the elements but was easily broken off by a careless blow. In the museums we see various efforts to support the *business part* of metal or pottery utensils by means of wooden handles more or less ingeniously affixed. As far back as we can remember, there have been all sorts of pots and skillets with metal or wooden knobs and handles which seemed but slightly to do justice to the vessels themselves. In the case of tea kettles and coffee pots, for instance, cover knobs have been but short lived —and there have been burnt fingers. We remember when department stores carried a line of tea kettle knobs which the housholder might purchase when the initial one had been lost or disintegrated.

There have been wooden knobs and handles indeed. How often have you ordered demitasse, and found a very excellent pot of silver marred by a kind of negroid handle which looked weather beaten, and felt soggy? Perhaps this univiting attachment has already become loosened, in which case the coffee pot will jiggle perilously over your cup.

A graceful handle of the bar type is well incorporated in the design of this aluminum boiling pot. Bakelite material is also utilized for the cover knob.

It is, of course, easy to realize that wood has been used for a variety of handles because of its availability, low cost, and low thermal conductivity. In contrast to these good properties, however, are numerous disadvantages such as moisture absorption, shrinkage, swelling, charring, and impermanence of color.

In conclusion, we would say that the business of providing handles for cooking utensils is not exactly a simple problem. Necessarily, in such case, they must be subject to much the same treatment as the metal body of the vessel. Conversely, it is generally desirable that the handle be nonmetallic. We surmise, therefore, that the desideratum would lie somewhere between metallic and non-metallic materials. In properties, Bakelite material can be so classified. It seems to have gone a long way in solving an age-old problem.



# Non-Breakable Phonograph Records Have Wide Appeal When Illustrated

Here we are confronted with an innovation in that hardy perennial, the unbreakable record,—an illustrated phonograph record that carries on its face a pictorial representation of its subject matter in order to make a firmer impression of the text on the auditor. Such a record, and especially when it can be made of slow-burning cellulose acetate instead of the more risky pyroxylin, offers wonderful possibilities, some of which have already been commercialized, as the illustrations above indicate.

The makers of these records are the Glee-Heart Record Co., Inc., who have recently acquired a plant in Belleville, N. J., for the manufacture of unbreakable, illustrated records and, according to reports, production continues at a lively pace. One number, in particular is enjoying considerable sales. That is the series of illustrated horoscope records, one of which is depicted above. There are twelve records in the complete set and each disc is decorated on both sides, signs of the zodiac on one side and the appropriate astrological symbols on the other. The mysteries which these signs symbolize are expounded on the record very clearly and sonorously by a gentleman who received the necessary information from an Egyptian princess, a direct descendant of one of the pharoahs. The reverse of the record carries in each case a carefully selected song of the month, sung by a soprano, previous to which is recited a mode of conduct, based on the horoscope, which the listener can well afford to heed.

Another noteworthy adaptation of the illustrated record idea is the political campaign record. The one illustrated above is adorned with a picture of the National Capitol at Washington. The reverse bears the portrait of a gentleman who now occupies a seat there in the halls of Congress. One face of the record bears a record of the candidate's campaign speech to his constituents and the other side a specially arranged campaign song.


**The horoscope record, with the signs of the Zodiac imprinted.**

As an example of these records used for souvenir or advertising purposes is the one with Sir E. J. Poynter's painting, The Visit to Aesculapius reproduced on one side, the other bearing photographs of the first eight presidents of the American Medical Association. For use on the phonograph, one side of the record has the song "The Old Family Doctor" and on the other, Matthew Arnold's famous poem "The Doctor". The records were made for the medical society.

The records, according to the manufacturers, can be run indefinitely on the ordinary phonograph with faithful reproduction of the recording artists' efforts. Some of these have had as many as 22,000 runs over a period of five years. They can be handled without any fear of breakage. No special packaging is required for shipping. A single record may be slipped in an envelope, addressed and mailed without using boards for protection. Many new possibilities suggest themselves for records of this type. Scenes from operas, musical comedies, sound movies and dramatic productions may be reproduced with the accompanying audible parts and sold in the lobbies of theatres instead of sheet music and scores.

# Nema Molded Section Holds Meeting In Jackson

*By R. C. Gilmore, Jr.*

***Publisher, Plastics and Molded Products***

THE Molded Insulation Section of the National Electrical Manufacturer's Association held the second meeting this year at the Sylvan Estates Country Club near Jackson, Michigan on the third Tuesday of July. Twelve member companies were present, as follows:

Kurz-Kash Co.—C. Kurz; H. Kasch; J. Bouman; C. J. Terrill.

Schneider Bros. — A. B. Schneider.

American Insulator Corp.—P. Huidekoper.

General Electric Co.,—H. D. Randall.

Connecticut Molded Products Corp.—F. J. Walker.

Belden Mfg. Co. — L. L. Stratton.

Mack Molding Co.—D. S. Kendall.

Norton Laboratories Inc.—J. B. Neal.

Westinghouse Elec. & Mfg. Co.—E. H. Ott.

Chicago Molded Products Corp.—W. L. Kelley.

Northern Industrial Chemical Co.—B. E. Schlesinger.

NEMA—S. N. Clarkson.

Guests also present:—

W. G. Nagel Electric Co.—W. G. Nagel.

Scranton Button Co.—R. H. Allen.

General Plastics Inc. — H. Dent, R. E. Dodd.

Bakelite Corp.—H. V. Swan, Wm. B. Hoey, H. Carlson.

Continental-Diamond Fibre Co.—G. E. Landt.

Plastics Publications Inc.—R. C. Gilmore Jr.

H. G. Addison of Arthur Colton Company, reading of the meeting in July PLASTICS, also arrived in the afternoon to join the festivities.

Without a doubt the meeting was one of the most successful ever held. John Rossiter, of the Reynolds Spring Company, aided by C. R. Downs, A. S. Sherman, R. A. Austin, (Vice President), and Mr. Seybold, not only proved excellent hosts, but provided the ways and means for a remarkable business session. Meeting at the Hotel Hayes, the whole group boarded a bus and went to the Reynolds plant where a personally conducted tour took place.

The plant is large, equipped to handle volume as well as quality and is very well arranged. The press room and tool rooms especially were way above the average. Easily accessible from all sides, with plenty of clearance, the presses were turning out a wide variety of pieces for the automobile, electrical, radio and various other industries. Two large boilers and three pumps (each able to run the plant alone) and a water softener are installed in the basement; the press room, finishing, inspection and packing rooms on the first floor; the tool room on the third. There is also a hospital, with nurse in attendance, on the main floor.

### Valuable Statistics Reported

After posing for their photographs, the men left in the bus for the country club, where luncheon and refreshments were served. Immediately after lunch the business meeting began, lasting until late in the afternoon. This long session accomplished a great deal, electing a committee to investigate the possibilities of a Trade Name, adopting a resolution to get together data effecting standard cost accounting, passing a motion to collect statistics on losses on tools, if any, for the past two years, and disclosing that for the first quarter of 1929, twenty molders, less than ⅓ of the total in the country, did finished business amounting to $3,038,012.00! It was a pleasant surprise to note that six of the companies reporting are not members of the section.

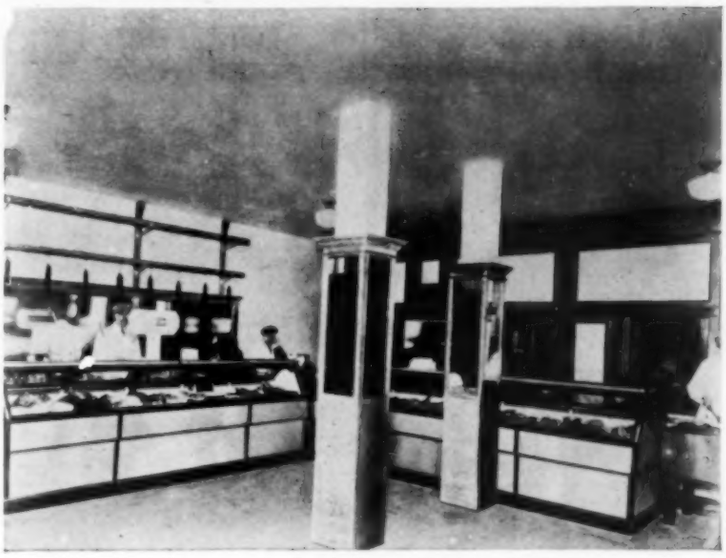
After the meeting those who were foresighted enough to bring their clubs and clothes played golf over the nine hole course. The writer played twenty seven holes with Bill Hoey of Bakelite and got a good trimming for his efforts. Most of the golfers finished just in time for the dinner at eight o'clock; a very fine meal to finish an enjoyable and profitable day. After all the refreshments were consumed, the section returned to Jackson, where the men separated for other entertainments. The writer, having missed one train, decided to stay over with R. H. Allen of Scranton Button and go with him to Scranton. However, getting up at six o'clock to catch a mythical 6.33, made us wait until 3.38 in the afternoon, too late for a Scranton visit. The morning was spent "Trouble shooting" at the Cardon Plant and at the four chain stores in Jackson.

Not only was the meeting well attended but there was a fine spirit of co-operation present. This was materially aided by the reception given by John Rossiter and his colleagues. They performed their duties perfectly, giving impetus to the business meeting and a fine opportunity for outside recreation. It is our earnest hope that future meetings will be half as successful and enjoyable.

**Molded Insulation Section**
**Report of Finished Business***
**First Quarter 1929**

| | |
|---|---|
| January | $766,410.24 |
| February | 770,328.11 |
| March | 759,084.55 |
| April | 742,189.10 |
| Total | $3,038,012.00 |

*Twenty companies reporting



# Micarta in the Retail Shop

THE Paul J. Daemicke Company of Chicago, whose chief product is refrigerated showcases for butcher shops, delicatessen and other types of retail stores have pioneered in the application of Westinghouse Micarta to their products, and, with the co-operation of E. N. Bowles, Industrial Salesman, and R. J. Brennan, Micarta Specialist, of the Chicago Office of the Westinghouse Company, have added Micarta to a number of uses in their products formerly requiring expensive metal shapes and fittings. The result of this development has been very gratifying, both from the standpoint of improved appearance and manufacturing economy, and it strikingly illustrates the diversity of purposes to which Micarta plates and shapes can be adapted.

Highly polished black Micarta strips made from plate stock are used as a trim for these cases, and make a pleasing contrast against a background of green or white porcelain. "L" shaped angles also serve as trim around the edges and corners, and "U" shaped channels support all four sides of the glass windows. This glass is double, for better heat insulation, and specially shaped channels take care of bracing the two sheets of glass and maintaining the proper air space in between. Arcs cut from Micarta tubing serve as baffle plates to guide the cold air from the refrigerating machine towards the food on display and away from the glass, to prevent it from being steamed up.

# Fare Boxes Use Molded Parts

THE Johnson Fare Box Company make the fare registering device known as coin boxes for most of the large railroad, traction, and bus systems throughout the country. Considering the factor of twenty-four hour operation, and the delay and inconvenience caused by a machine temporarily out of service, special attention has been given to the matter of insulation. Over 50,000 Johnson fare boxes are now in operation in the United States, and there is a sizable export business in addition. It becomes important that every machine be made to function reliably. According to engineers of the company, a number of other materials were tried and rejected before Bakelite molded and laminated parts became the standard insulation.

Magnet coils are wound on Bakelite laminated tubing and are waterproofed with Bakelite varnish. The ends of these tubes are threaded so as to permit of assembly into Bakelite molded spool ends, in which a corresponding thread has been formed in the molding operation.

The same type of molded insulation is also represented by a switch base in which are incorporated three steel and six brass inserts. The adoption of Bakelite molding material for this unit made it possible to eliminate four machining operations, and there was a total saving of 50% over former cost.

The contact housing, also shown in the accompanying illustration, is an excellent example of deep-cavity molding. Two housings are completed at every closing of the mold, and there is a saving of 65% over former practice.

Bakelite molded and laminated coil-spool end and core contact housing and switch base, all used in Johnson fare box.

# News of the Industry

### New Beetle Booklet

The Synthetic Plastics Co., Inc. 535 Fith Ave., New York City has prepared for circulation in the trade a booklet announcing "Beetle", the new molding powder, being made in this country and available in light and translucent colors. Synthetic Plastics Co., a subsidiary of the American Cyanamid Co., concluded an arrangement, some months ago with British Cyanides, for the production of Beetle molding powders in America and have built and equipped a plant in Bound Brook, N. J., for making this material.

Beautifully illustrated with samples of Beetle products molded both here and abroad, the booklet describes the properties and color possibilities of the material and includes a lengthy list of items which are being successfully molded out of Beetle and others for which it is suitable. Mention is made of Kurz Kasch Co., Dayton, Ohio, Northern Industrial Chemical Co., Boston Mass., and Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., as custom molders equipped to use "Beetle". A copy of the booklet will be sent to anyone interested, on request.

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### Obituary

Nathan W. Hendryx, president of the Andrew B. Hendryx Co., manufacturers of pyroxylin bird cages, was found dead in the waters of Stony Creek, Conn., near his yacht, on the night of July 3rd.

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Coe Laboratories, Inc. 6033 Wentworth Ave., Chicago, Ill. announce the appointment of Major W. S. Rice as vice-president in charge of scientific research.

### Micarta Leaflet

A direct mail folder, 5171, on Micarta Airplane tailwheels, fairleads, hinge bearings, and cabin-lining plate has recently been released by the Westinghouse Electric & Manufacturing Company.

Micarta tailwheels recently put on the market are lighter and stronger, weight and size considered, than any other type of tailwheel at the present time. They are fitted with self lubricating bearings and are well suited to withstand severe service.

Micarta hinge bearings, of which a complete line are now offered are used for elevator, rudder and aileron bearings. They are lighter than ordinary metal hinges and very strong mechanically.

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## British Trade Notes

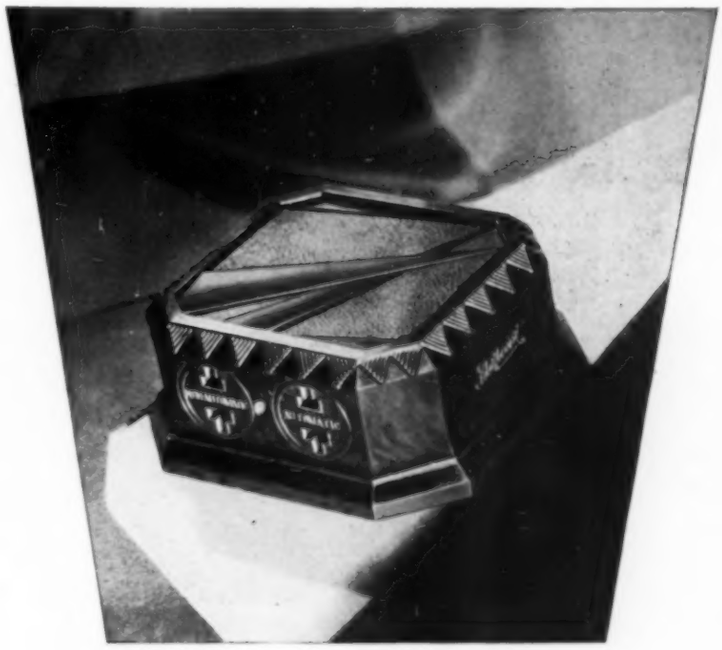
### New Molding Powder Offered

A new economical molding material to be known as "Kelacoma" molding compound will shortly make its appearance on the British market. The manufacturers claim that it will fill the protracted demand of the molding industry for a powder possessing strict uniformity, color, quality, flow in productive yield, and yet at a price sufficiently low not only to compare favorably with existing molding materials but to make this new powder one of the most attractive lines yet offered. Such a product is badly needed in the United Kingdom, for it has long been realized that in order to further the industry and place it in such a position that it need not fear Continental competition a cheaper molding material, having the best qualities of its more costly competitors, was definitely needed.

# MOLDED BY GENERAL ELECTRIC

## TEXTOLITE MOLDED

**SUITABLE for the perfectly appointed table is this handsome Textolite molded timer box, molded by General Electric for the Edison Electric Appliance Company. Assembled, it serves as a convenience outlet for electric appliances. ¶ The rich green and ebony finish, which enhances the modernistic design, comes direct from the molds —no polishing, no machining. And it will last a lifetime without refinishing or polishing. ¶ In this timer box—and in all products of Textolite molded—are incorporated all the experience and technique acquired by General Electric in producing half a billion moldings. ¶ Thus Textolite molded, attractive, durable, dielectric, combining General Electric's unexcelled facilities for research and for production, gives *complete* satisfaction to all users of molded parts.**



885-21

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

# GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Kelacoma powder is a new Urea compound. However, instead of the many pocesses required when forming condensation products with aqueous formaldehyde, solid polymers of the aldehyde combined with a certain proportion of a phenolic resin are used, and it is possible to combine the required chemicals, fillers and coloring materials in a dry state, thereby eliminating many of the difficulties that occurred when using preliminary condensate gel solutions.

Moldings produced from Kelacoma powder possess great mechanical strength, will not soften in water, and remain completely unaffected by most chemicals. An important advantage is their remarkable uniformity in color and the certainty of good "pulls" with the minimum of waste. The power is easily pelleted and has good flowing qualities, with a minimum of "curing" time. Beautiful transparent, semi-transparent and brilliant mottled effects, molded exactly to form, are easily obtainable.

The powder is to be manufactured under the strict supervision of the highly-trained and experienced technical staff of the Kelacoma Laboratories at the firm's new factory at Welwyn Garden City, 22 miles out of London.

### British Record Manufacturers Faced With Over Production

A. E. DALL, of Beth, England, president of the British Phonograph Dealers' Association, stated at the annual dealers' conference, which has just been held at Folkestone, that the enormous increase in phonograph records, especially in those bearing the same title, was out of all proportion to the turnover. The tendency is for stocks of records to increase more and more, and there seems to be no end to the number which may be made of the same item. This problem is exercising the minds of all connected with record production in the United Kingdom.

The conference was held in connection with the Music Trades' Association, and it discussed the formation of a trades association, to be called the Music Merchants' Association, the object being to maintain "clean" trading both in the interest of the public and also in that of the music industry itself. The British Music Industries Convention, which was also held at Folkestone at the same time, erected a model shop window at the Hotel Metropole which was changed twice daily in order to show the 300 delegates, dealers and manufacturers attending the conference how a music dealers' window can be made attractive.

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### Plasticizers in Great Britain

The steady increase in the use and application of cellulose ester lacquers in Great Britain has stimulated interest in materials for lacquer manufacture, including solvents, synthetic resins, and plasticisers.

Products now being used as plasticisers in addition to castor oil are dibutyl phthalate, diamyl phthalate and tricresyl phosphate, the last named being desirable also from the standpoint of reducing the inflammability of the lacquer. Dibutyl tratrate is also used as a plasticiser in the manufacture of nitro-cellulose lacquers and pyroxylin plastics, as well as a camphor substitute in the manufacture of celluloid and films.

A new group of plasticisers, the use of which is increasing in Great Britain, is the derivatives of the cyclohexanol group. Two of the principal plasticisers in this group now being marketed are cyclohexanol phthalate and cyclohexanol oxalate. Both of these substances are white crystalline solids with a faint odor, contain no water, have low volability and are soluble in the usual lacquer solvents and dilutents. They are also noninflammable and do not attack metals.

## Uniform Cost Systems*

THOMAS W. HOWARD Chamber of Commerce of the United States, urged executives of the electrical manufacturing industry to continue their interest in uniform cost accounting in an address delivered before the second session of the Policies Division of NEMA at Hot Springs on May 20.

Quoting from an address which was made thirteen years ago by the Honorable Edwin M. Hurley of the Federal Trade Commission, Mr. Howard said: "When business was done on a large percentage of profit, questions of accurate cost and of operating efficiency were not so important, but in most lines of industry today the large percentage of profit has passed. Manufacturers are working on smaller margins and must absolutely know what their goods cost. Any unreliable method of arriving at cost of production with margins of profit so close must be eliminated." It is significant that this viewpoint was first expressed at the time of publication of the first edition of "Standard Accounting and Cost System for the Electrical Manufacturing Industry."

Mr. Howard went on to discuss some rather striking variations in range of manufacturing costs reported by manufacturers making an identical article.

In that connection Mr. Howard said: "In looking into the matter, by procedure which I shall later describe, it has been found that the diversity of methods of cost accounting are responsible in large part for these great variations. Our records show that in the case of various groups with which we have been in contact, 20 per cent of the manufacturers reported that they did not have cost accounting systems which were tied in with their general accounts; 60 per cent did not go to the extent of providing separate rates of overhead for their

*Reprinted from Nema News

different classes of operations. Among these manufacturers four different common methods of distributing overhead to products were found, and only one manufacturer in ten used the machine-hour rate method in his overhead application.

"These are but a few evidences of the under-development of cost accounting procedure," Mr. Howard continued, "and of the diversity of methods employed. Obviously the cost figures laid before the executives in any one of these lines of industry could not be on a comparable basis.

"So let us not fool ourselves. Most of us do not yet know very much about our costs. We are, however, I verily believe, on the threshold of the new day in the matter of cost accounting. For years we have been struggling with details of the cost accounting mechanism, and even now we are suffering from the amateurish attempts of executives who insist on using homemade methods. But we have arrived, in my judgment, at a time when modern technique in cost accounting properly applied will yield results which, correctly used by the executive, will give him the control over his business he has never had before. In other words, the executive can solve all of the economic problems of his business if he is armed with reliable cost facts."

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## New Pyralin Products

(*Continued from page 464*)

ples of fuel to a searching chemical analysis. When reported, such an analysis is an imposing array of figures concerning moisture, volatiles, ash, sulphur, fixed carbon, total carbon, and B. T. U. values which must be translated into a figure that clearly indicates the heat value of the coal compared to its cost.

The calculation of this important figure is complicated by the allowance for ash which must be made, and by the fact that the figures involved extend well into the millions.

Recently an ingenious device has been put on the market by the Coal Specialties Company of New York. It is a circular chart, the outer edge of which represents the delivered cost of coal per net ton. The circle is laid off into divisions covering a range from $2.50 to $6.50, at the rate of one cent for each division. Upon this circular chart is a semi-circular one of the same diameter, attached in such a manner that it is free to rotate upon the chart beneath. A portion of the outer edge of the semi-circular chart is also laid off into divisions representing per cent ash, while one of its radii is divided to represent B. T. U.'s per pound of coal. This chart makes the computation of fuel costs most simple. By setting the per cent ash opposite the delivered fuel cost, the cost per million B. T. U.'s is read from a spiral graph covering the face of the complete circle. On the back of the device is a set of tables for quickly converting gross tons into net tons.

An interesting fact in connection with the fuel value computer is that the calculations upon which it is based were all made in the du Pont Viscoloid Company's laboratory. This unusual device is made entirely of du Pont Pyralin sheeting, which was chosen because of its attractive appearance, its durability, the accuracy with which it can be cut, and because it is always easily cleaned. Pyralin sheeting is extensively used in manufacturing practical devices of the kind illustrated here. It is a well-chosen product for the purpose.

## Greener Grass

(*Continued from page 464*)

mobile field, two of the largest users, found that those specializing in making phenolic compounds could do a cheaper and a better job. The largest users of radio molded parts, buy their material in the open market. The electrical manufacturers representing a large consumption, are in some instances, compounding their own material. Some buy their material and blend it for final use. Some buy part and make part. Generally they are curtailing their manufacture and bringing more material in the open market; not an enticing situation for the beginner.

### How a Year Was Wasted

One of the largest corporations in the country, in the food products field, attempted to develop a phenolic resin for their own use. They figured that they could use a by-product.—A chemist or specialist, drawing a very handsome salary worked for a year discovered that all that he had done was impracticable, and that which his employers wished to accomplish was impossible, and that anyone really experienced in the manufacture of phenol plastics could have saved a year's work and proved its inadvisability in twenty minutes.

A problem encountered by the manufacturer maintaining his by-product compound department for economy, is that his manufacturing departments do not want to fuss with the material of their own plant when they can buy the guaranteed product from a reliable source, supplying them day in and day out, a dependable, uniform material that is not going to slow up production or pile up a lot of rejects during a busy season.

# Advertisers Index





The advisability of attempting to manufacture phenolic plastics, can be investigated with comparatively little difficulty. A surprising thing is that so many have apparently attempted it without first collecting facts and figures and investigating all of the avilable data of those who have succeded. Of course, those attempting to make a sufficiently inexpensive compound, to market it profitably as well as those who absorb all of their home made materials, could hardly have anticipated that the best available phenolic plastic would drop in price fifty to seventy percent within a few years time.

Not so long ago, a large glass manufacturer, or rather molder of glass, figured that as he was a molder, he should, because of the trend to plastic molded articles, further capitalize his experience as a molder and not only mold, but make his molding compound. Fortunately, he was cautious enough to investigate other phases of phenolic compounds before he climbed the fence in what appeared to be a greener pasture.

### Using By-Products

The owner of a small gas plant, found that in their manufacture, they developed some coal tar and that this contained phenol. "Phenol is used to make phenolic plastics and phenolic plastics is going big," said they, and hustled into this new field in which they soon found out, how little was merely having a small quantity of phenol. They also found that to make enough molding compound would require more phenol than they could develop to make this new venture not only profitable but even practical.

It is of course true, that the phenolic product field is a large one. It has great possibilities. Those who never try, never succeed; but it is a highly specialized field in which the manufacturer of a mediocre material cannot succeed. His product must measure up by scientific tests, to those of well established competitors, with years of experience and well founded reputation and substantial sales records.

The new organization, the manufacturer attempting to manufacture his own material must realize he is in a highly technical field, one that has made rapid progress in the improvement of its product, as well as the methods of manufacturing it and not only be prepared for a long development period, but to move sufficiently fast that he will catch up if not over-take his agressive predecessors. He must be prepared to meet the trend of prices for his finished material and to secure an adequate supply of raw material continuously. He will also do well to make certain that he has ample funds to carry on his work before he undertakes it.